ENGINEERING AND MINING JOURNAL

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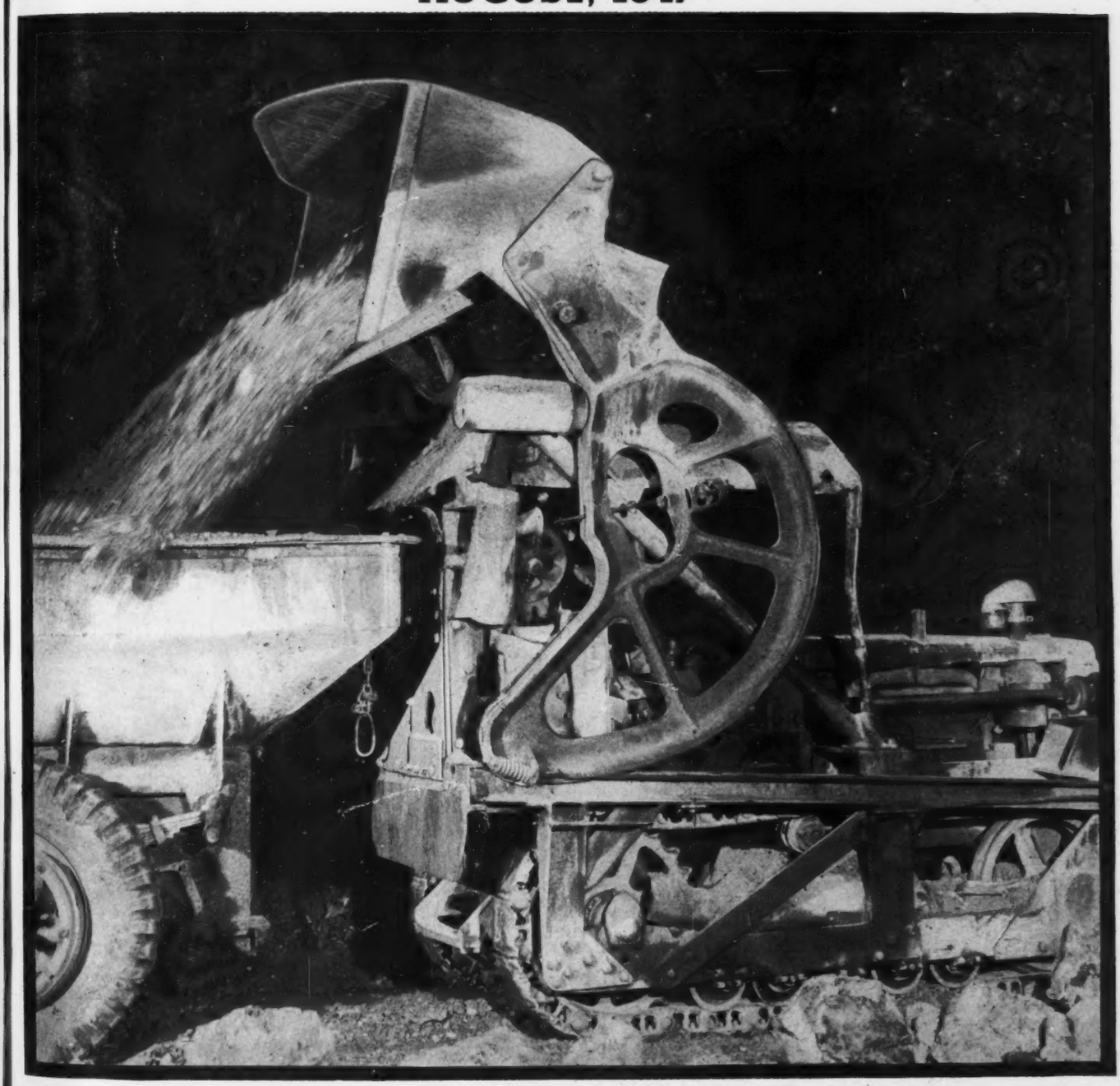
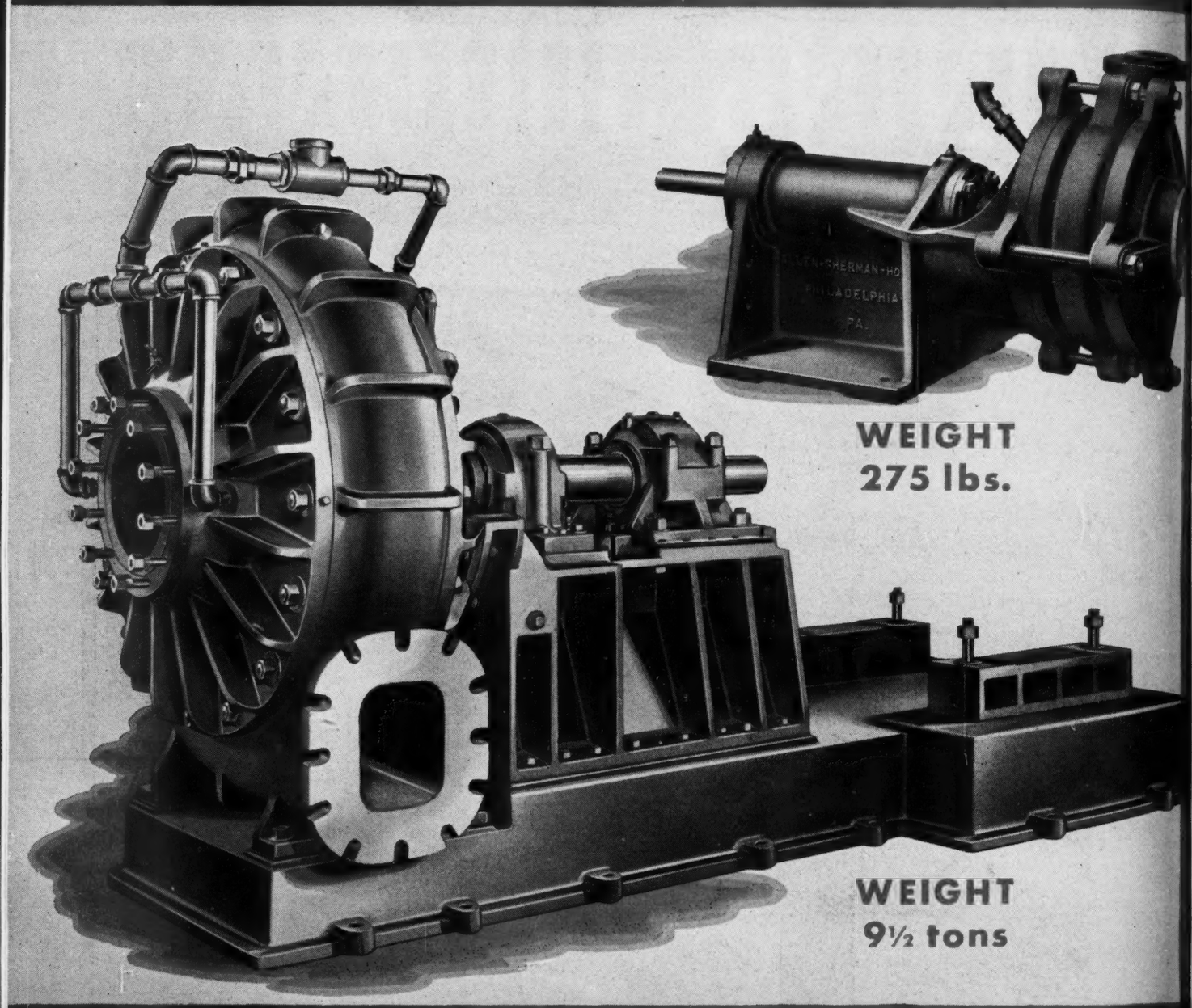


Crawler-mounted diesel-powered shovel in one of Eagle-Picher's Tri-State mines. See page 91

Electric Smelting in Copper-Nickel Metallurgy — Page 86

Mammoth or Midget



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August 1947

Employers Must Guard Their Rights

LABOR'S RESPONSE to what its leaders have uniformly and roundly denounced as the Taft-Hartley "slave labor" Act is beginning to take shape. Briefly, labor seems to be adopting two courses: one, to proclaim a boycott of the National Labor Relations Board and to try to settle all disputes by collective bargaining; two, to attempt in this bargaining to get the employer to sign away certain privileges and protections that the Taft-Hartley Act gives him.

As for the first course, it is one thing for labor to boycott the NLRB as a plaintiff, but quite another to ignore it as a defendant. The unions can not long maintain this disdain of the Board if employers begin to bring cases up for action. However, we do think that the less both management and labor have to do with Government agencies the better, and if the unions will really try to get settlements by collective bargaining alone, that is after all exactly what the Taft-Hartley Act was designed to promote.

As to his privileges under the Act, we think it the poorest judgment on an employer's part to gain a temporary advantage by signing away the protection the Act gives him. For example, John L. Lewis, with his tremendous power in the coal industry, gained a new contract that remains in force only as long as his coal miners are "willing and able" to work. An effect of this clause soon appeared at one mine where the management decided to start the working day at 8 a.m. instead of 7.30 a.m. The miners weren't "willing" to make the change, they said, so they have gone right on coming to work at 7:30.

Following John's lead, the CIO United Automobile Workers union has announced that its executive board would now approve "only those collective bargaining agreements which absolve the union in writing of any legal liability for alleged contract violations." The Mine, Mill and Smelter Workers are making similar demands of A. S. & R., Kennecott, and Phelps Dodge. To make such an agreement would put the employer in the position of having called upon Congress to grant him certain rights and of then signing them away as soon as he got them. The effect of that on some Congressmen, who felt they risked their political necks by voting for the Taft-Hartley Bill, may easily be imagined.

There is no question but that most unions will fight the new law with every weapon they command, and the pressure on management in ways such as the foregoing will be terrific. It is up to management to resist these pressures, not in its own interests so much as in the interests of all who want industrial peace.

Safety Has an Effect on Costs

TOP MANAGEMENT must keep itself posted on changing trends in production methods to evaluate the factor of safety in each change, stated Oliver Iron Mining Co.'s president, R. T. Elstad, in an address at the mine safety conference in Duluth, reported in our July issue. An effective safety program, he continued, raises output, lowers operating costs, and results in a "healthier, happier and much less volatile labor and industrial situation." The great motivating force behind accident prevention, he had previously said, is of course the humanitarian desire to alleviate pain, suffering and death and its attendant factors.

While serving to emphasize the principle that interest in safety must begin at the top if a company's program is to be effective, and stressing the effect of that program on labor relations, these remarks carry another message also for mining men everywhere: A good many companies today are confronted with the need of changing their mining method or modifying their underground practice in other respects, to meet new economic conditions, particularly those of increased wages. This is true in many places, to say nothing of the Iron Country

where it has had the spotlight thrown upon it. In making such changes, unless regard is had for safety, the results may have a different effect on costs than that sought. In recent years, various mining companies, in Canada and elsewhere, have turned to use of diamond drills for blast-hole work, and have modified their stoping method at the same time for greater efficiency. Frequently, this has made mining safer for the driller where used. It has therefore increased the value of the change. On the other hand, if we regard those cases where operators who use much timber seek to cut the quantity because it has become so costly, we may discover a resultant rise in accidents. No change in practice is to be considered as progressive, if this is an outcome.

Adequate Testing for New Developments

OPERATORS who try to cash in on a new development in equipment or process may find that it has to be adapted to their conditions or perhaps is hopelessly unsuitable. To avoid such occurrences, cautious sponsors of such developments usually provide for a thorough testing and try-out in the field. This procedure is likely to pay everybody better in the end. It takes time, however, as anyone who has ever done test work knows.

Nothing would illustrate the course of a major development in mining practice better than the story of the underground mucking machine in metal and nonmetal mining. Successful present-day loaders, such as the interesting cat-mounted, diesel-driven one shown on the front cover of this issue, were preceded by a large number of earlier machines which in general failed to obtain wide use, for varying reasons. Van Barneveld's bulletin, of several hundred pages, published by the Bureau of Mines in the Twenties, describes the earlier work and models in great detail.

Today the industry has before it some interesting new developments, prominent among which are tungsten-carbide bits. The latter, so far as rock drills are involved, have made their bow to the domestic industry within the last six or seven months. Abroad in Sweden, Germany and South Africa, they have been known to operators for a longer period. To date the experience had with such bits is varied but in general very promising, to judge from accounts in technical papers and verbal reports. (*E. & M. J.* itself has published various articles).

It is evident that mine operators will want to work with carbide bits, in collaboration with the manufacturers, to see what design of bit, including the carbide insert, is best suited to a given kind of ground; likewise what type and weight of drill, what kind of steel, and what conditions of operation will give the best results. On the resultant of these many factors probably will depend the success obtained. It may not be too much to say that a dozen different mines will each require a separate study. Eventually certain generalizations and standardizations will doubtless be possible.

If some time elapses, therefore, before large tonnages of ore are mined with carbide bits, or big footages in development work are drilled, it need cause no surprise. It will be quite the normal thing to expect, in an operation where conditions vary as they do in mining. The performance of carbide bits in rock drills is so remarkable in many instances that there is evidently a prize worth going after. In fact, one individual who is surely an authority in this field, expects the use of carbide to revolutionize the operation of breaking ground.

Geochemical Prospecting Should Be Useful

IF COMMONLY HELD THEORIES of the origin of hypogene ore deposits are right or even half right, geochemical prospecting should eventually prove to be useful.

The field of geochemical prospecting need not be assumed to be restricted to the search for products of disintegration of orebodies by analysis of vegetation, ground or surface waters, soils, and outcrops. It can be expected to have possibilities in the search for manifestations of the mineralizing process such as alterations of, additions to, or subtractions from country rock by mineralizing solutions. The study of rock alteration in the Tintic district is probably an example, the findings seeming to indicate that sericitization denoted proximity to ore whereas kaolinization, bauxitization and calcification did not. Sericitization was also noted in the neighborhood of ore in the geological study of the San Manuel copper deposit. These findings were based on mineralogical studies, but careful geochemical work would probably corroborate the mineralogical picture.

Even allowing for a considerable range in the nature of mineralizing solutions, or even presuming them to be gaseous, it seems certain that the warm fluids which transported ore materials from

deep-seated sources to their present positions must have reacted with the country rock beyond the place of deposition of the ore itself, and must have left some chemical trace of that reaction.

In searching for such traces of the passage of mineralizing solutions, care must be taken to maintain an open mind as to the kind of anomalies expected. One should not confine expectations to traces of the ore metals of the district or even of the ordinarily commercial metals. The rare metals and the abundant metals that do not occur commercially in hypogene ores might be tracers, also the nonmetallic elements. Deficiencies, rather than additions, might be useful.

The speed, convenience, completeness, cheapness, and accuracy of spectroscopic analysis make it recommendable as an analytical method for this type of work. Incidentally, as in the case of geophysical prospecting, the danger is not so much in a deficiency of anomalies as in proper interpretation of anomalies and the sifting of the meaningful from the useless. The complications that have developed in the interpretation of soil analysis in the oil fields suggest that it may be a long, hard pull before interpretation of geochemical observations is developed into a reasonably trustworthy method of finding ore.

For example, even with such shallow orebodies as occur in the Tri-State district it would probably be a mistake to condemn geochemical prospecting if a survey based on surface samples fails to reflect known orebodies. Some geological observations based on the direction of ore mineral growth suggest that at least in parts of that district the mineralizing solutions were moving laterally at the time of deposition. This example points up another lesson that should have been well learned from experience in geophysical prospecting, that no one method should be applied without seeking all other available lines of evidence bearing on the problem.

Despite the probable complications in the application of geochemistry to practical ore finding, we earnestly believe this is so promising a line of attack that forward looking mining companies will not ignore it.

Cost Cutting by the Coal Operator

PRESENT WAGE LEVELS are a spur to labor saving. High labor costs promote the use of better equipment, automatic controls, and anything that will do the work in hand with less labor and raise the output per man.

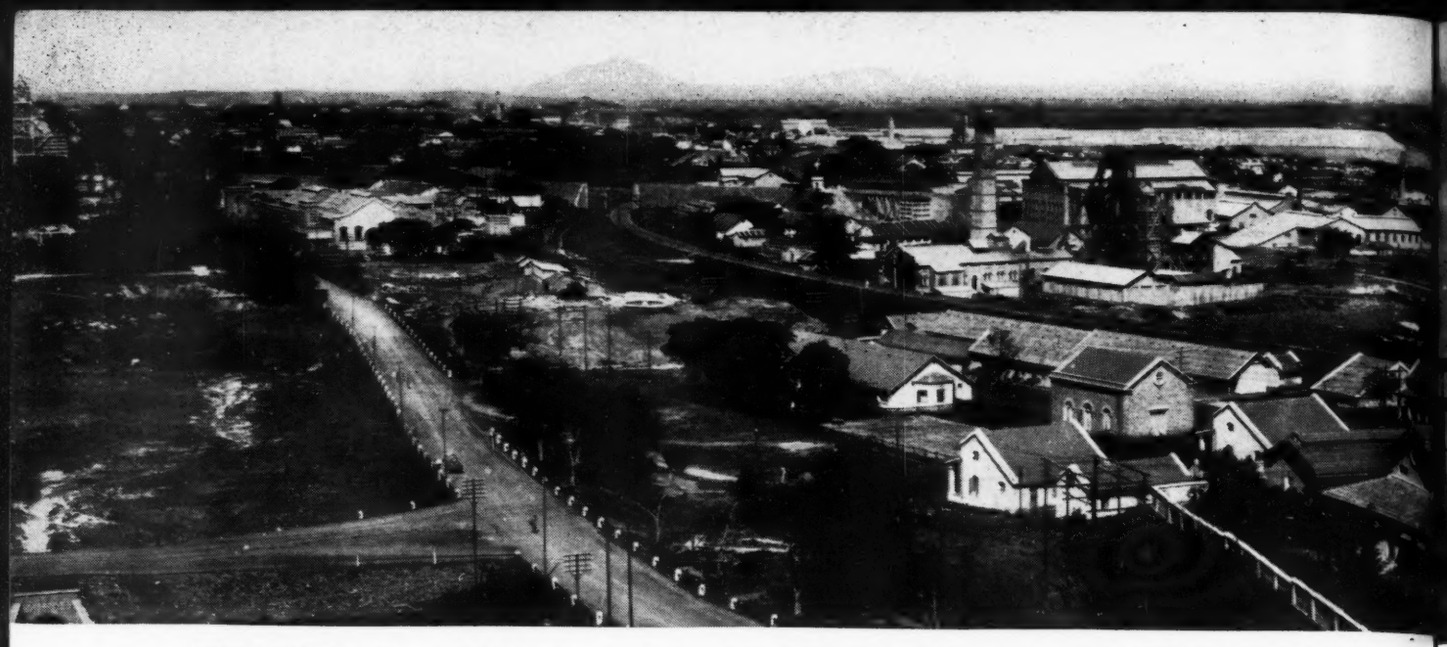
In their search for new ideas for reducing costs, mine operators will do well to consider the coal industry. Bituminous mining conditions, of course, differ in various respects from those that obtain in metal mines. In the bituminous field huge tonnages of materials are handled at a very small net margin of profit. This margin was only 18¢ per ton in 1945, on a cost of $2.96 which included administration and selling. A high degree of mechanization has been the result.

The history of underground bituminous mining in this country shows a steady increase in the use of power for doing the work once performed by hand. Successively, the steps have been: (1) Introduction of power cutting and power hauling. (2) Substitution of power drills for hand augers, the latter being much used up to 10 or 15 years ago. (3) Introduction of power loading—at $15 a day for the man for 250 days a year it means more than it formerly did to get rid of a man on the loading crew. (4) Increasing displacement of locomotive haulage and the required train crews by belt-conveyor transport, supplemented perhaps by shakers. (5) Miscellaneous applications of power.

Among the latter, it will be interesting to note the use of timbering machines for lifting the heavy cross bars (or caps) to their exact position under the roof and holding them there while they are being secured in place. Timbering once required many men. Several large coal operators are finding these machines of use and four or five models are in service. Power-manipulated mounted drills (or jumbos) are replacing the earlier models that had to be adjusted in position by hand. Power is also being used, and needed, to shift the position of the duckbill employed in loading a shaker conveyor—a manual task until recently. An older use of power and equipment for dispensing with manual work is to be found in the automatic control of centrifugal pumping, familiar to many coal operators. Pumps otherwise require watching, the problem then being to keep the pump man busy so that he will earn his pay.

In addition we would again call attention to the novel coal-mining equipment described on page 91 of the *E. & M. J.* for July.

Whether the items mentioned appear familiar or strange to the *E. & M. J.* reader, he will perceive that the two major divisions of the mining industry have much in common, despite their differences in products, practice and tradition. Each has to contend with the problem of rising costs, caused largely by labor's success in exacting high wages. Each ought to be able to learn something from the other.



SEVEN SHAFTHEADS are visible in this general view of the field. Mine workings cover a strike length of four miles.

Deep Mining Problems in

JACK SPALDING, Mining Engineer, John Taylor & Sons, London, England

Mining narrow veins at depths of more than 9,000 ft. in India's Kolar Gold Field has introduced ramified problems of ventilation, ground control, and hoisting. The ensuing article traces the development of air-conditioning systems, rock-burst prevention, and shaft design which have made this deep mining feasible and given firm reality to present plans for working to 11,000 ft.

THE KOLAR GOLD FIELD, situated in Mysore State, in the southern part of the peninsula, accounts for practically all of India's gold production. Four mines are now operating in this field; namely, Mysore, Champion Reef, Ooregum, and Nundydroog. They work adjoining lengths along the strike of a single lode system. Since 1882, 720 tons of gold has been mined from the Kolar field, with a value of roughly $400,000,000. The present annual output is 170,000 oz., which, at the price of gold now ruling in India, is worth more than $13,000,000.

Mysore is a "Native State," meaning that it has its own ruler and government. It is therefore not included in the collection of presidencies and states which are known as "British India," and the mines are liable for taxes not to the Government of India but to the Mysore State. In addition to revenues from royalties and gold duties, the Mysore Government has also a substantial income from the sale of power and water to the mines.

The mines are owned by separate companies registered in London, England, but are under the single technical management of Messrs. John Taylor & Sons, consulting engineers. This unification of management has greatly facilitated administration and inter-mine cooperation.

Deepest Mine 9,200 Ft.

Worked continuously for the past 65 years, all four operating mines have reached vertical depths in excess of 7,500 ft. The deepest working in the field (and, incidentally, in the world) is found in the Ooregum mine, which is now down 9,200 ft. Allowing for a surface elevation of 2,900 ft., this point lies 6,300 ft. below sea level.

At surface the workings have extended over a strike length of about ten miles, but the ore on the fringes did not persist to great depth. The present workings cover a strike length of only four miles.

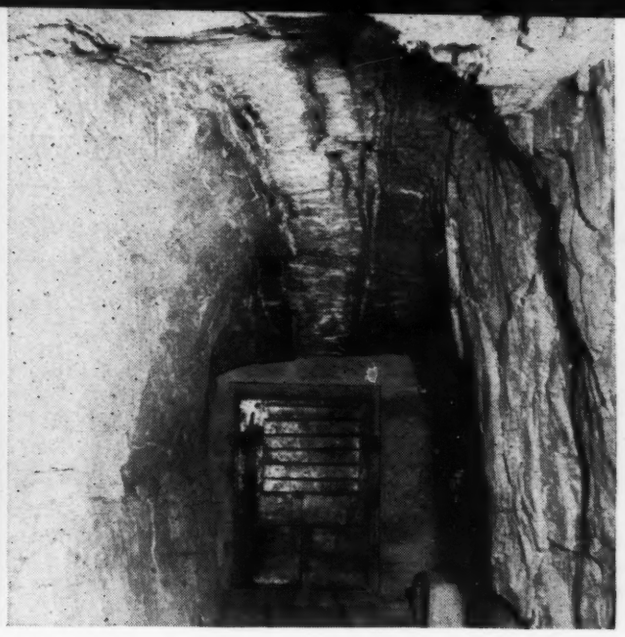
The gold occurs in a vertically dipping quartz lode in a belt of ancient hornblende schists which are in turn surrounded by several generations of younger granite. Denudation throughout the known period of geological history has removed the overlying rocks from the present surface, which was once at a depth of several miles.

The lode varies in width from a mere stringer up to tens of feet, averaging about four feet. Values are high but patchy, the general tendency being toward small oreshoots, with intervening areas in which first the value and then the quartz dies out. There is little or no gangue; a small amount of augitic or micaceous material is usually but not invariably found alongside the quartz. The average grade of the ore mined varies between 6 dwt. in the leanest to 12 dwt. per ton in the richest sections, though in the past it has been much higher and once ran as high as 40 dwt. per ton in one of the mines of the district. Other minerals are found to occur only in trivial amounts, the gold itself being free milling.

In attaining the present great depth of mining many difficulties have been encountered and overcome—difficulties caused by the high temperature of the rock at depth; the autocompression of the ventilating air in descending the

Photo by South East Asia Command

THE EDGARS SHAFT of the Mysore mine.



THE VEIN seen along the back of a level is the Champion lode.

the Kolar Gold Field

downcast; the heavy rock pressure; and the great depth of hoisting.

The rock temperature at 9,000 ft. of depth is 140 deg.F., the geothermic gradient at this horizon being 1 deg.F. per 115 ft. Fortunately the mines are naturally dry; little water is encountered below 3,000 ft. To maintain the wet-bulb temperature within workable limits, water, wherever found, is immediately collected, inclosed in pipes, and pumped to surface. Great care is taken that nowhere in the mines shall wet surfaces be exposed to the ventilating air.

Mines Air-Conditioned

Ten years ago, when mine workings were approaching a depth of 8,000 ft., temperatures had reached the limit of human endurance, efficiency had fallen to a very low figure, and cases of heat exhaustion were a daily occurrence. Temperatures usually stood in excess of 90 deg. wet bulb, with a dry bulb of 110 deg. to 115 deg.F. Only men born and bred in the tropics could endure such conditions; for the white inhabitants of colder climates they would prove intolerable. The European staffs of the mines were able to spend only a few hours underground at a time.

Air-conditioning plants have now been installed in all the mines, and ventilating air is fed into the top of the downcast shafts at 40 deg.F., saturated. The quantities of this conditioned air sent underground vary from 120,000 cu.ft. per minute in the smallest mine to 250,000 in the largest. The air-conditioning installations are all sited on surface, and comprise refrigerating plants of standard design using ammonia as the refrigerant. A solution of calcium chloride is used as the cooling medium, circulating through air coolers of the coil type. The installations use 400 to 1,000 hp. each, according to size and the season of the year.

At surface the average barometric pressure is 27 in. of mercury (3,000 ft. elevation), and at 9,000-ft. depth it is 36 in. The effect of this rise in pressure is to compress the downcast air so that its volume is reduced at the bottom by 16%: 200,000 cu.ft. per minute on surface becomes 168,000 cu.ft. at the bottom.

Another effect of this autocompression is to raise the temperature of the air. Thus, in descending 9,000 ft. an automatic temperature rise of 40 deg. F. takes place quite apart from the rise due to the heat picked up from the rock sides of the airways. The actual temperature of the downcast air at 9,000 ft. of depth is 100 deg. F. dry bulb, 75 deg. F. wet bulb. In this way the large quantity of air conditioned at surface has its volume considerably reduced and its temperature much raised in descending to the bottom. On the other hand, its humidity remains low, and conditions in the workings are comparatively good. The highest temperatures commonly found are of the order of 120 deg. F. dry bulb, 88 deg. F. wet bulb. These are at the foot of the upcast. Normal conditions in the stopes are about 110 deg. F. dry bulb, and 80 deg. F., wet bulb.

Lower Levels Are Dry

The upcast air reaches surface at about 70 deg. F. saturated, so that more than 8 gallons of water are carried out of the mines per minute per 100,000 cu.ft. of conditioned air sent down. Little water develops below 3,000 ft., and to keep the humidity and wet bulb temperature as low as possible, no water is used in mining. The lower levels are therefore completely dry. As a natural result the air at times is somewhat dusty. Nevertheless, the incidence of silicosis is remarkably low. This can perhaps be attributed to the following circumstances.

1. The rock is of such a character that it does not naturally form ultra-fine dusts.
2. The quantity of ventilating air used is large compared to the amount of ground broken.
3. Reciprocating machines are widely used in development, and hand-drilling is still common on the upper levels.
4. Cage hoisting is largely used, so that no dust is produced in the downcast shafts.

Experience with air conditioning in these deep mines has brought to light four points of great interest

PACK WALLING a working place with rectangular granite blocks. This rigid type of support has proved a vital factor in preventing rock bursts.

and economic importance, namely:

1. The enormous increase in human efficiency which follows improved working conditions.
2. The progressive cooling effect.
3. The increase in the power of natural ventilation.
4. The reduction in consumption of compressed air.

Efficiency Increases

Before the first air-conditioning plant was put in operation, efficiency in that mine was at a very low ebb, and the stage of uneconomic operation was obviously within sight. On starting up the plant, however, there was an immediate and substantial improvement in the amount of work done, and this resulted without any special drive on the part of the management. The development footage per machine month jumped 25%; the amount of granite supports built in stopes rose 100%; and other work improved similarly. As a consequence of this increase in efficiency the capital cost of the air-conditioning plant was recovered in a very few years.

An extremely interesting and unexpected result of the improvement in working conditions was a sudden drop in the accident rate. As time went on, it was found that the lower rate was maintained. It showed a fall of 30% from the rate which held before cooling was initiated.

When a surface air-conditioning plant is installed, the dry-bulb temperature of the air reaching the bottom of the mine does not immediately alter, because the temperature of air emerging from the end of a long airway depends on that of the rock surface through which it has been flowing. The wet-bulb temperature, on the contrary, drops suddenly with the decrease in absolute humidity. As time passes, the rock sides and equipment of the downcast airway are cooled, and so the dry-bulb temperature of the air at the bottom gradually falls, the wet-bulb following proportionately.

This progressive cooling effect, in deep mines such as those at Kolar, continues for years, and a "zone of coolth" is built up in the rock surrounding the downcast. The improvement in conditions in the workings which is manifest after the first week's running of a cooling plant is in practice found to be only a fraction of what is achieved after several years in operation.

Eventually, the rate at which heat flows from the surrounding rock inwards through the "zone of coolth" enveloping the downcast is balanced by the rate at which it is removed by the ventilating air. Temperatures then become static, and no further progressive cooling can be expected. Until this point has been reached, however, progressive cooling more than makes up for increases in temperature due to the extension of the mine in depth during the period. Even with rocks of high conductivity the time span is one of years rather than months.

Cool Air Aids Ventilation

The great weight of the downcast column of air, when a surface cooling plant starts operation, causes a large increase in the natural assisting ventilation. The increase is of such magnitude that, in the Ooregum mine, for example, one year after the plant began operation it was found that the main fan (230 hp.) was no longer necessary. Two years later, as progressive cooling continued and the natural ventilating power rose correspondingly, the two booster fans (150 hp.) were also stopped. This mine, the deepest in the world, now runs on natural ventilation only.

When the first air-conditioning plant was installed a sudden automatic decrease in the consumption of compressed air took place. This was due to the complete cessation of the practice of "blowing off," which had come about because of the almost intolerable conditions previously obtaining.

The saving in horsepower from this cause, together with that resulting from the elimination of the ventilating fans, is about equal to the power required to run the plant. It can therefore be said that the introduction of air conditioning in the Kolar gold field has been a great success, not only from the standpoint of enabling the mines to carry on operations at much greater depths than would otherwise be possible, but also from the immediate economic point of view. As a result plans are now being projected to extend mining to vertical depths of more than 11,000 ft.

At a depth of 9,000 ft. the dead weight of the overlying rock works out to a factor of 750 tons per square foot. Under this terrific weight the rock at depth is compressed. Excavations made in this compressed rock give it an opportunity to expand inward into the opening. In so doing highly differential stresses are set up, and these are greatly intensified if the shape of the excavations is unsuitable.

Both the lode quartz and the schist country are hard, strong, though somewhat brittle rocks of a character which may be likened to that of plate glass. Therefore, when failure of the rock takes place, as in mining it frequently must, this failure is sometimes not the slow crushing and crumbling of the rock commonly experienced, but a sudden and violent collapse. Such failures are called rock bursts.

Rock bursts have been common on the Kolar gold field at and below depths of 1,000 ft. Their rate of incidence at first increased with depth, but was later checked and has now been greatly reduced by the improved methods of mining and support which have followed increased understanding of rock pressure and its effects.

Granite Pack Walls Used

The biggest factor in reducing the incidence of rock bursts has been the introduction of a very rigid type of support in the form of granite walling. The granite is mined by native contractors from numerous surface outcrops. It breaks naturally into rectangular blocks and makes an excellent building stone.

The granite is usually placed without mortar and was at first built into continuous pack walls running down the dip; "pigsties" (timber cribs), packed with granite, were inserted at intervals. These acted to support each section of the buildings used in bottom stoping, and to localize any failure of the pack wall which might occur under the squeeze of the walls. The buildings commonly had a strike length of 7 to 8 ft., with gaps between varying from 12 ft., at moderate depth, to 4 ft., in the deepest workings. The proportion of support thus increased with depth from 40% to 65%. In wide lodes the strike length of the buildings and sometimes of the gaps between has been increased above these figures.

Gaps between buildings, when not required for ventilation or other purposes, are filled with waste rock from development, to prevent the buildings from falling out if their faces should crumble under the pressure of the stope walls. As the percentage of payable rock from development is usually low, sufficient waste is generally available for this purpose.

In the deepest workings, say below 8,000 ft., the tendency is now to mine by back or breast stoping only. "Pigsties" have been eliminated, partly on account of the fire risk they create and partly because their rigidity, even when packed with granite, is less than that of plain granite buildings. At the bottom of the Champion Reef mine, rill stoping has been practiced for the last ten years with 95% support of roughly built granite. The stope face is advanced until it is 10 or 12 ft. above the rill. All ore is then scraped down by hand and drawn off. Granite is dropped into the stope from above and slides down the rill to the bottom. Working from this point upwards the rill is built up solid with granite to within 3 or 4 ft. of the face and finally surfaced with a weak concrete mortar. The cycle of operations is then repeated.

This extremely costly system was started in an abnormally large and rich oreshoot, because it was considered impossible to mine the ore in safety and to obtain complete extraction with a lower-percentage support. Even with this control (which must surely be the heaviest in the world), rock bursts have occurred whenever supports have fallen behind because of shortages of supply, as during the war period.

Stoping Sequence Vital

Almost equally important with ground control in preventing of rock bursts is the maintenance of an orderly sequence of stoping. If an oreshoot can be worked out from one boundary to the other by a series of stopes, all with their faces more or less in one continuous line, so that neither pillars, remnants, nor promontories of ground are left, the liability of rock bursts is reduced to a minimum.

Unfortunately, the extremely irregular outlines of most of the oreshoots in the Kolar field, and the inclusion of large, low-grade or barren patches within richer ground, often render the formation of such a plan difficult and its execution still more so. Most rockbursts in recent years have been caused by the inability to mine in an orderly sequence by reason of irregular ore conditions.

When rock bursts have occurred, the greatest damage has always been found on the levels. As passage through the levels is invariably required for rescue or repair work, the necessity to find a shock-proof lining has been extreme. Timbersetting was soon abandoned, for several reasons, chief of which was the complete collapse of the sets under the force of a rock burst, invariably leaving the level choked with debris which it was a slow and laborious task to clear. Various types of rigid linings of concrete, granite, or brickwork were experimented with, both built tight to the ground and ringed with cushions of waste-rock packing. None of these types of rock support was successful however.

Later, a lining of steel rings was tried. This lining, now universally used, was found to stand up well to heavy shocks and sudden, extreme wall closure because of its flexibility. On many occasions steel sets have been badly distorted by rock bursts, but seldom are they so badly bent that it is impossible to make a way through them. About 50 miles of levels are now lined with steel sets.

Steel Drift Sets Made of 90-lb. Rail

Since the local railway began changing over to a heavier gage of track, a large quantity of secondhand rails has been available at a low price. Although not a very suitable section from the engineering point of view, these 90-lb. rails have been adopted as lining material by reason of cheapness and availability, and they form a strong though somewhat heavy set.

The sets are formed in the mine workshops, the rails being bent with the web at right angles to the plane of the set, so that lateral distortion or buckling when squeezed by the ground is entirely eliminated. Both circular and elliptical sets are used, although the latter shape is more common. The inside dimensions of elliptical sets are 7x5½ ft. The sets are formed in two pieces, joined at the top and bottom by slipping the ends into loosely fitting sleeves which are made from ⅜-in. steel sheet bent up to form an open-ended box; the joint is welded. This method of connecting the two halves is found in practice to be much superior to fish-plated joints from the standpoints of cheapness, ease of erection, and strength. Moreover, when sets have been damaged by a rock burst or by slow pressure of the walls, it is found that this type of joint lessens the damage, and, when stripping out a lining, facilitates the removal of distorted pieces. Sets which have been bent

ELLIPTICAL STEEL SETS, formed from 90-lb. rails, are now used to protect levels against rock burst damage.

BOTTOM STOPING is in progress here, using hand steel. Note the "pigsty", or timber crib packed with granite blocks.

are reshaped in the mine shops and used again.

Sets are spaced 3 to 4 ft. apart. They are lagged around with 3-in. poles and packed outside with a minimum thickness of 9 in. of waste rock. Experiments with various sections of corrugated steel lagging are at present being conducted with a view to producing a completely fireproof lining at reasonable cost.

Blocks Line Winzes

Much trouble is experienced with winze linings. As a satisfactory technique has not yet been worked out, the tendency is to reduce the number of winzes in ore between levels to the absolute minimum required for stoping, which is one per oreshoot. Steel-set linings have proved less adaptable to winzes than levels, partly due to the difficulty of holding the lagging and packing in a vertical position until approaching stoping throws stress on the ground and grips them. Concrete linings tend to crush ahead of the stope face, with the result that the winze enlarges to such an enormous size as to be unusable. Perhaps the most satisfactory lining so far found is one made of pre-cast concrete blocks built dry to form a circular winze 5 ft. in diameter. The blocks are packed around with finely broken waste rock. This lining, being set without mortar, is to a certain extent flexible, and so stands up to ground movements which would badly damage more rigid constructions.

In ground away from stoping operations, such as shafts, stations, chambers, and crosscuts, arched linings of concrete on vertical sidewalls are commonly used, and have proved entirely satisfactory. The sidewalls are usually built up of selected stones of waste set in a mortar of fine concrete; sometimes brickwork is used. The arch above is of circular or elliptical section, with the long axis of the ellipse horizontal. This shape gives a strong roof with good headroom near the sides.

The early shafts in the Kolar gold field were rectangular in section, lined with timber, and equipped for skip hoisting. As the mines grew deeper and these old shafts became inadequate, new vertical shafts were sunk from surface to depths of 3,500 to 4,500 ft. These were circular in section and lined with brick or concrete. From the bottoms of the primary shafts, secondary shafts were eventually extended down another 4,000 ft. more or less. The stage of tertiary shafts has now been reached, and hoists are being installed at depths of more than 8,000 ft. With this layout it is proposed to deepen the mines an additional 3,000 ft.

When skip hoisting is used, much handling is necessary in lowering the large tonnage of granite which is required for the control of ground in stoping. Cage hoisting eliminates this handling, as the granite is sent down in what would otherwise be empty trucks, and has therefore now become standard practice, with considerable influence on shaft design.

Elliptical Shafts Best

Rectangular shafts have long been abandoned, because such a shape is not adapted to ground under heavy stress and because a timber lining is unsuited to dry mining. On the other hand, circular shafts do not lend themselves to cage hoisting, owing to the difficulty in arranging decking from both sides. Accordingly, elliptical shafts were tried and are now used at all the mines.

The minor axis of the shaft ellipse varies between one-half and two-thirds the length of the major axis.

A shaft measuring 20x11½ ft. is typical in size. Two cages are used for hoisting ore, holding two 1½-ton cars per deck, and two smaller man cages are provided for inter-level travel. One end of the shaft is divided into sinking compartment and ladderway.

The linings of the elliptical shafts are concrete, with or without reinforcement, according to the nature of the ground. Brick linings are not considered strong enough for use in the deepest shafts.

All Equipment of Steel

All-steel equipment is used down to the smallest detail, including ladder sollars, ladders, fencing for the ladderway, and pipe hangers. These are made up in the mine shops, together with all necessary attachments, ready for bolting into position underground.

It is common practice to hoist from the bottom station while sinking proceeds below that level. An inclined chute is therefore driven up to hole through the end of the shaft, and the sinking bucket dumps directly into it. Above that point the ladderway, which has a somewhat constricted space at the bottom, is enlarged to take in the whole end of the shaft.

At the Champion Reef mine the primary shaft, originally 3,600 ft. deep, has now been extended to 5,560 ft. It is a brick-lined, circular opening 18 ft. in diameter. The hoist is driven by two geared motors on the Ward Leonard system, and takes a peak load of 5,200 hp. The bi-cylindro-conical drums are 13 to 35 ft. in diameter. Flattened strand ropes are used with a diameter of 1⅞ in., and weighing over 20 tons each. The pay load of 10,000 lb. of ore is hoisted in four cars at a speed of 3,000 ft. a minute. This is the deepest hoisting installation in the world.

Serious fires, one of which involved considerable loss of life, have broken out at various times in the Kolar gold field. They occurred in the older workings which were largely supported with "pigsties" and through which ran timbered or timber-lagged levels. In such hot, dry mines, timber, especially when crushed, becomes like tinder, presenting a constant fire hazard. For this reason present practice is to reduce the use of timber to a minimum. Steel, concrete, and masonry are used wherever possible. To give two examples: Chutes for boxholes are made entirely of steel designed for attachment direct to the steel sets; and headframes for winze sinking are built of steel, and are fabricated on surface to include the dump for the bucket, steel, chute, cover doors, and other fittings. In this way the fire risk is being eliminated in the newer workings, but the risk remains considerable in the upper parts of the mines, large areas of which have been reopened owing to the present high price of gold. These workings contain acres of old stopes filled with crushed timber.

To facilitate isolating potential fires, the mines are divided by "seals" into sections. The "seals" follow largely the natural divisions between the oreshoots, but are carried across stoped ground where necessary by constructing a bar of sand-filling or concrete. Winzes and levels passing through "seals" are provided with steel doors with arrangements by which the doors can be covered with a layer of fine tailings sand to render them gas-tight. Thus, in the event of fire, the section affected can be sealed off and the fire choked with its own products of combustion.

Eucalyptus oil, poured into the compressed-air main at surface, is used as a warning of fire. The pungent smell of this oil issuing from the exhausts of every machine soon permeates the entire workings. The miners are taught that they should lay aside their tools and proceed at once to surface on perceiving this odor. This method of warning every man in the mine has proved most satisfactory.

An up-to-date rescue station, centrally located in the field, is amply equipped with oxygen apparatus for fire fighting and rescue work.

Much Work Done by Hand

Mucking, tramming, and drilling by hand have been common practice in the Kolar field owing to the low rates of pay of the Indian miners compared with those in occidental countries. It has been found that mechanization did not pay. In recent years, however, rates of pay and standards of living have been rising so rapidly that mechanization is now becoming an economic possibility.

The basic pay of an unskilled Indian miner is 25¢ a day, but with bonuses, dearness allowance, and other benefits, his total cost to the company is nearer 70¢ a day. For this he does about one-third the amount of work that would be done by an African native or a white man. Thus very large numbers of men have to be employed for a comparatively small output, and hoisting capacities must be large to preclude undue delay in getting the men on and off shift.

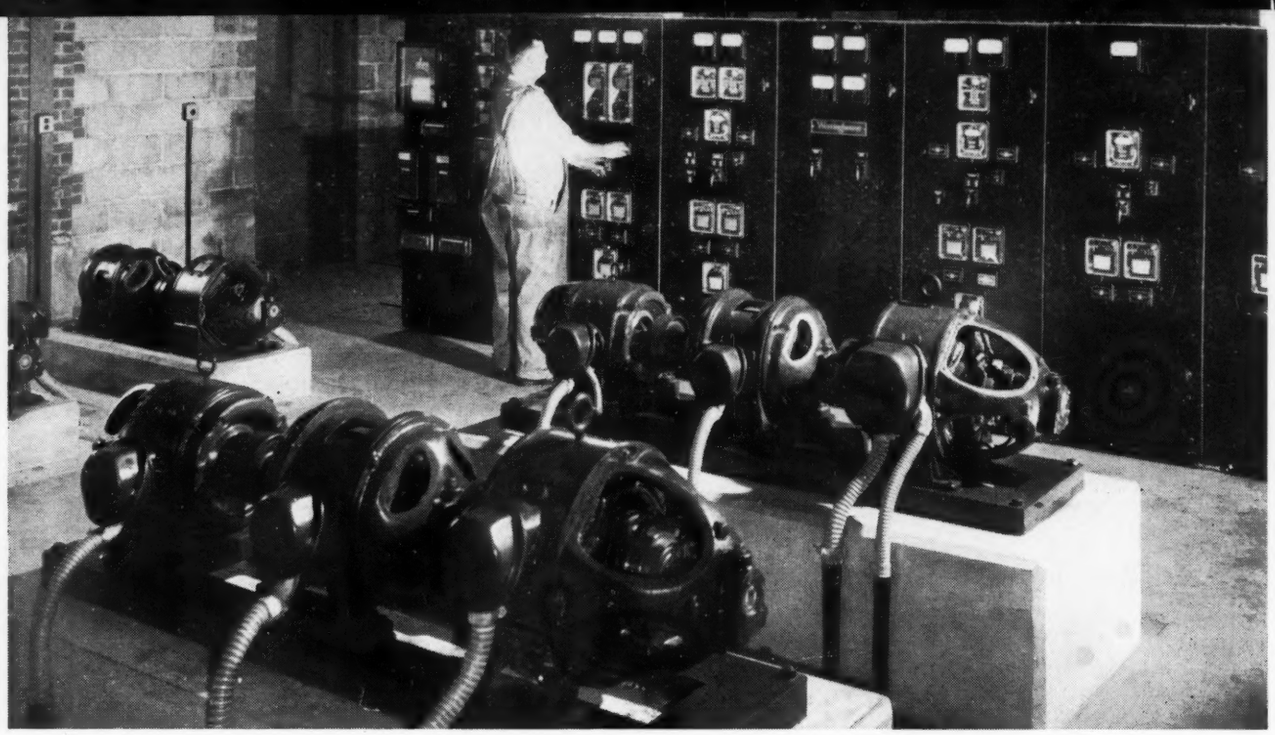
The senior company officials are all European, whereas the juniors are Europeans mixed with a number of Indian mining engineers. There is room for more native engineers, but underground mining is not a profession attractive to the average Indian of education, who prefers a more sedentary and less robust existence. There are both European and Indian foremen, but the former predominate owing to the difficulty of finding Indians of suitable capabilities. The miners are all Indians, mostly of the Tamil race with some Malayalis from the Malabar coast, who are easily trained. The Tamils, in particular, are a mechanically minded race, but their physique is poor. They average little more than 100 lb. in weight and lack the personality necessary for supervisory work.

Directly employed in the mines are 25,000 Indians out of a total local population of 135,000. As the Kolar field is situated in an unfertile area of low rainfall, virtually uninhabited in former times, the entire population is dependent on the mining industry.

Taxes Are Heavy

The price of gold in India has now touched $80 an ounce. However, the mines derive scant benefit from this, owing to the heavy taxation imposed by the Mysore Government. On top of the usual royalties and income tax there is also a duty on the gross value of the gold sold, amounting to 75% of the excess by which the sales price exceeds $30. Thus, with gold at $80 an ounce, the net price received by the mines is $42.50, and from this other taxes have still to be deducted.

Recently the Government has permitted a refund of up to half the duty under certain circumstances. To win the refund an agreed target must be attained each year: a predetermined tonnage of ore of average grade must be mined and a stipulated footage of development work carried out. Finally, if the mine is unable to show a profit, a refund is allowed sufficient to pay a 7½% tax-free dividend.



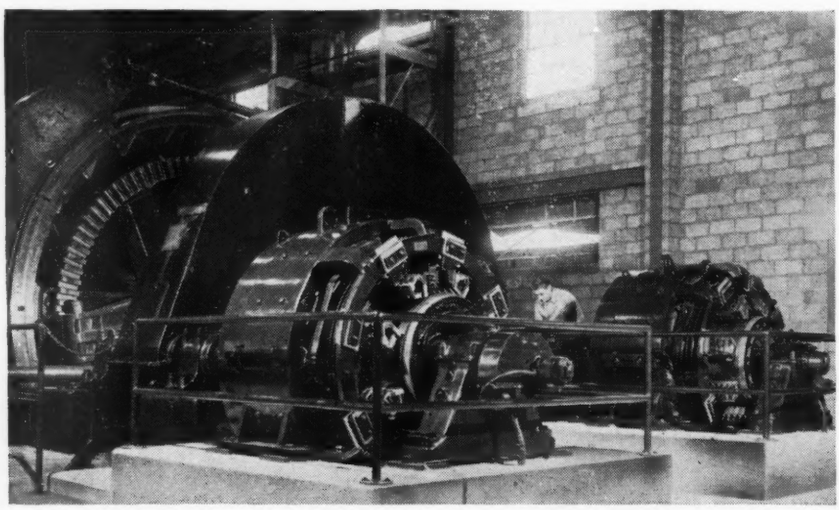
THE SMALL MOTOR-GENERATOR SETS in the foreground are the rotating regulators that control speed and limit maximum torque of the 900-hp. hoist motors by controlling the excitation of the 750-kw. d.c. generators that supply power to these hoist motors. All of the a.c. power circuits that service the surface and underground operations at the Mt. Hope mine are fully protected and switched in the multi-panel metal-enclosed switchgear which is shown in the background.

Variable Voltage System

Harry Davenport, Superintendent, Mount Hope Mine Division, Warren Foundry & Pipe Corporation, Mount Hope, N. J.

TO WORK the deep iron ore deposits and increase production at the Mt. Hope mine of the Warren Foundry & Pipe Corporation, near Dover, N. J., a program of expansion was started late in 1941 that resulted in the sinking of a new vertical shaft to a depth of 2,674 ft., and the construction of a new surface plant that is approximately 2,000 ft. east of the site of the former plant.

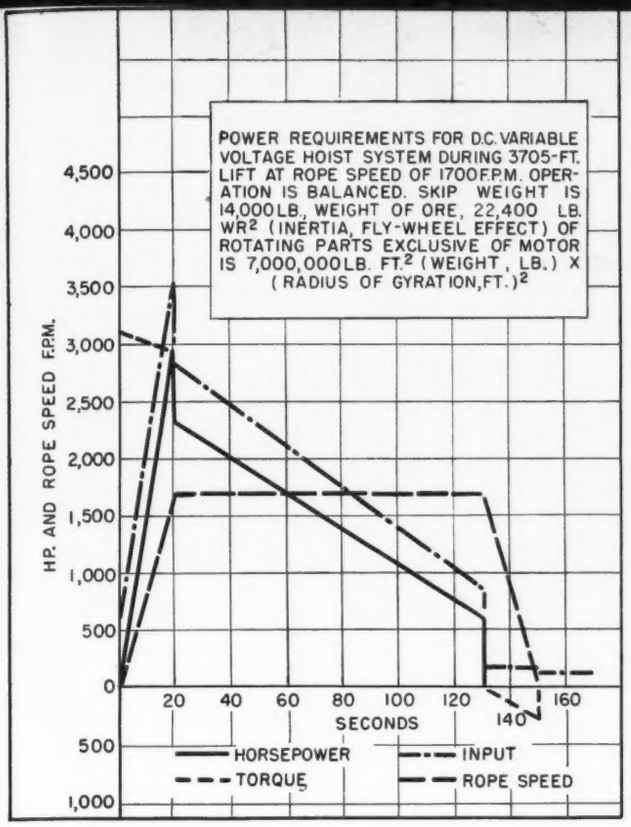
As a result of this expansion, power requirements were greatly increased. Power being purchased on a contract that contains a power-factor penalty clause, a careful study was made of the probable demand, power factor, and kilowatt-hour consumption. The principle worry was the demand superimposed by the ore hoist. New equipment, capable of operating at 1,750 f.p.m. when hoisting 22,400 lb. net load, was needed to handle the increased daily output. A peak load of 2,950 hp. for this new hoist meant a problem of voltage regulation and over-all power factor for the serving utility unless proper equipment was used. Analysis showed that the best overall operation and system regulation with high power factor could be obtained with a variable-voltage hoist system. Cylindrical-drum hoists driven by d.c. motors were therefore installed. The motors received their power from synchronous motor-generator sets rather than from flywheel motor-generator sets because of the power factor advantage inherent in the synchronous-motor drive.

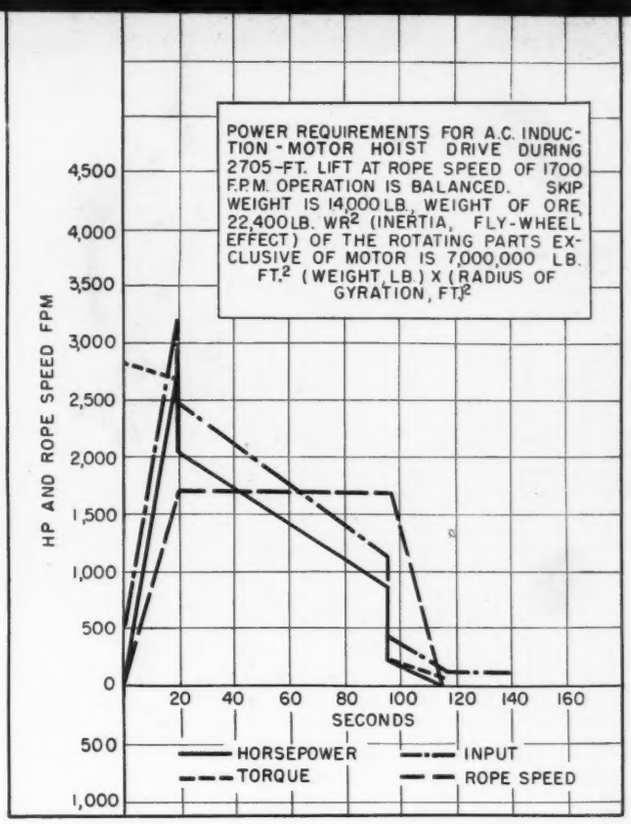


TWO 900-HP. D.C. MOTORS pinioned to main gear drive of ore hoist.

A comparison of the power consumption of the two systems is made in the accompanying table, and of the input in the two graphs. Analysis of the hoist operations indicated that the savings in demand and energy power costs would pay for the higher cost of direct-current variable-voltage equipment within a few years.

An additional advantage of the variable-voltage hoist system that derives from the power-factor pen-


POWER REQUIREMENTS FOR D.C. VARIABLE VOLTAGE HOIST SYSTEM DURING 3705-FT. LIFT AT ROPE SPEED OF 1700 F.P.M. OPERATION IS BALANCED. SKIP WEIGHT IS 14,000 LB., WEIGHT OF ORE, 22,400 LB. WR² (INERTIA, FLY-WHEEL EFFECT) OF ROTATING PARTS EXCLUSIVE OF MOTOR IS 7,000,000 LB. FT.² (WEIGHT, LB.) X (RADIUS OF GYRATION, FT.)²
HP. AND ROPE SPEED F.P.M.
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
500
1,000
20 40 60 80 100 120 140 160
SECONDS
HORSEPOWER
INPUT
TORQUE
ROPE SPEED


POWER REQUIREMENTS FOR A.C. INDUCTION-MOTOR HOIST DRIVE DURING 2705-FT. LIFT AT ROPE SPEED OF 1700 F.P.M. OPERATION IS BALANCED. SKIP WEIGHT IS 14,000 LB., WEIGHT OF ORE, 22,400 LB. WR² (INERTIA, FLY-WHEEL EFFECT) OF THE ROTATING PARTS EXCLUSIVE OF MOTOR IS 7,000,000 LB. FT.² (WEIGHT, LB.) X (RADIUS OF GYRATION, FT.)²
HP AND ROPE SPEED FPM
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
500
1,000
20 40 60 80 100 120 140 160
SECONDS
HORSEPOWER
INPUT
TORQUE
ROPE SPEED

Cuts Power Costs

alty clause in the power contract is that it should be possible to cut the power substantially, which indicates that the additional cost of the a.c. wound-rotor type of drive as compared with the variable-voltage system might be recovered readily within a few years of capacity operations.

A hoist control that provided both good speed regulation and torque limitation for the application was desired. Rototrol rotating regulators were installed. This equipment automatically limits the torque, thereby reducing maintenance and shutdown charges by lengthening the life of hoist ropes, preventing undue mechanical wear on other mechanical parts, and reducing commutator maintenance. It keeps the inexperienced operator, moreover, from abusing the equipment and is said to relieve the capable operator of the need of watching indicators constantly to avoid overstressing it.

The variable-voltage hoist equipment is similar to any such equipment except for the use of the Rototrol regulators. These are small d.c. generators operating in the field circuit of the 75-kw. d.c. generator, thereby controlling the speed and limiting the torque of the 900-hp. hoist motors. The motors for the ore hoist are shown in an illustration. In the foreground are the two 900-hp. d.c. motors pinioned to the main drive gear. The Rototrol regulators, the armatures and special fields of which are connected in the field circuit of the d.c. generator, are shown in another view.

The outdoor substation through which power is received is outside the compressor house and control room which adjoins the hoist house. The plant distribution system is controlled from the main switchboard. Power is furnished to the lump-ore plant and the fine ore plant at 2,400 v., and step-down transformers are installed to supply the small mill motors at 440 v., 3 phase, 60 cycle. The mill drives are constant-speed, squirrel-cage motors and in the majority of cases—either direct-connected or geared. Interlocking controls are used throughout the plant.

In the mine, power is supplied to underground substations at 2,400 v. The cables are taken down the shaft in the utility compartment and at each operating level are looped through a pump and transformer station.

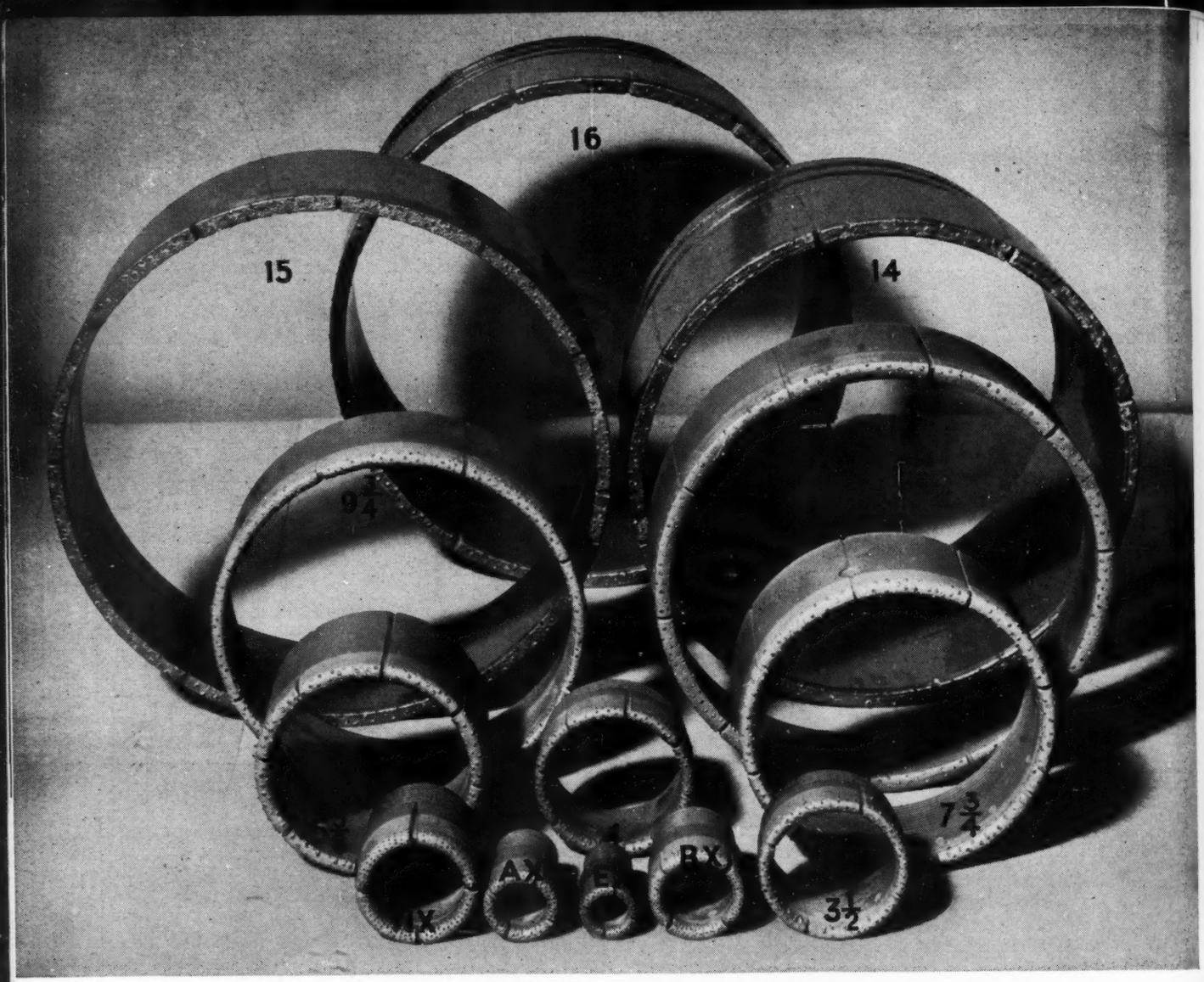
The underground substations are supplied over a 2,400-v. distribution system, each being of 300 kva. capacity. They have two or three 440-v. sub-feeders on the low-voltage side. This arrangement supplies power to the slope hoist and the mining machinery at the face at an average voltage of 460. Prior to installing the power-center transformer substations underground, the voltage of the mining equipment at the face would sometimes be below 360. Both the oil-cooled and the dry-type transformer are employed.

Power for electric haulage is provided by a 200-kw. synchronous motor-generator set composed of a 2,300-v. motor and a 275-v. d.c. generator situated near the shaft on the 1,700-ft. level. An underground crusher, installed below this level to crush the ore to 6-in. size before it is hoisted, is driven by a 100-hp. 2,300-v. motor.

Operation of all power equipment has been demonstrated to be satisfactory. The new distribution lines improved the voltage regulation and power factor.

Comparison of Power Consumption With the Two Systems

Rope Speed, Ft./Min.	Rope Travel, Ft.	Tons in 14 Hr.	Kw. Hr. Per Month Wound Rotor Induction Motor	Kw. Hr. Per Month D.C. Motor Driven by Variable Voltage M-G Set
1750	2705	3000	301,000	302,000
1750	2705	3800	373,000	367,000
1750	3705	3000	399,000	396,000



VARIOUS SIZES OF DIAMOND CORING BITS. EX. smallest size, yields 7/8-in. diameter core.

Use and Care of Diamond

The following article, sponsored by the Industrial Diamond Association of America, Inc., was prepared for the *Engineering & Mining Journal* from texts written by prominent operating engineers and manufacturers of diamond bits, who are members of the Association.

AS COST AND DEPENDABILITY are two factors of primary interest to firms engaged in diamond drilling, this article on the use and care of diamond bits and shells stresses these two aspects. By dependability is meant the accuracy of the location of the hole and the reliability of the sample recovered. By cost is meant the total expenditures required to finance the diamond drilling operation.

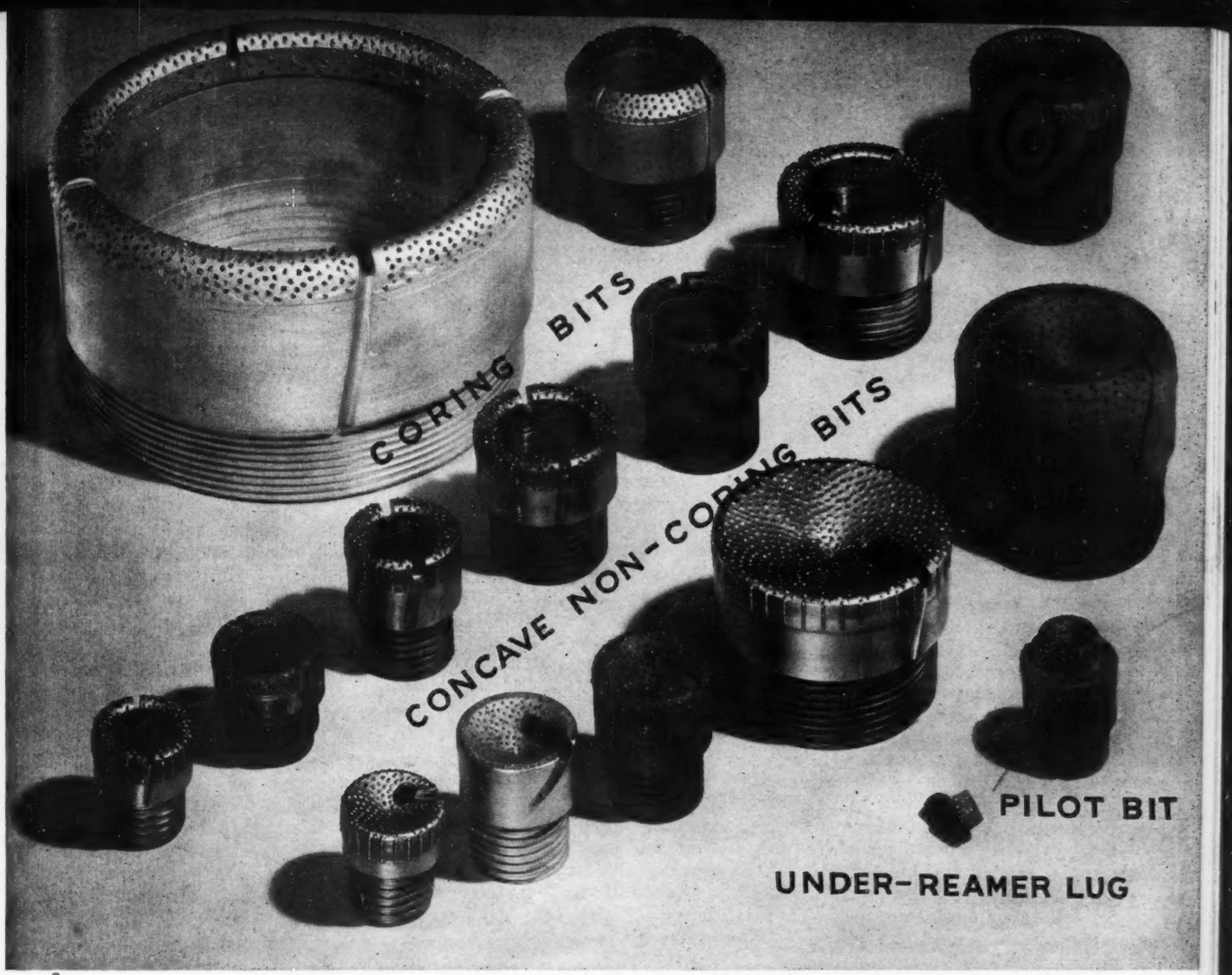
It must be remembered that there is no adequate substitute for experience. Accordingly, the recommendations outlined herein must be considered as general, and not intended to teach the inexperienced the art of diamond drilling in one short lesson.

There appears to be a rather wide diversity of opinion as to the type and character of diamonds best suited for diamond drill work, and no attempt will be made here to clarify this point.

Costs in Terms of Use and Care. In diamond drilling, labor is the principal cost. After labor, in other than very soft rock, yet depending upon the type of rock for its equation, the cost per foot for diamonds exceeds the combined cost per foot for all other materials, including depreciation on capital items. Consequently, the economical success of the average drilling project will depend very largely upon the use and care of the diamond-set bits and reaming shells.

Types of Bits. Three types of bits are considered here: coring, non-coring, and casing. Coring bits are those which produce samples of the material through which they pass. Non-coring bits merely produce holes for various purposes, such as blasting or drainage. Casing bits are used to introduce casing into a hole or enlarge a hole. Unless otherwise specified, the following general discussion applies to all three types of bits.

The Manufacture of Bits and Characteristics of Material. In order to understand properly the use and care of diamond bits, it is first necessary to consider briefly their manufacture and the characteristics of the material used. All



VARIOUS SIZES AND DESIGNS of coring and non-coring diamond drill bits.

Drill Bits and Shells

three types of bits mentioned above comprise mainly three parts: blank, matrix, and cutting medium. The blank is usually made of steel. The matrix is of copper alloy, including beryllium-copper or tungsten and nickel, or of powdered metal alloys which also produce tough settings. The cutting medium is of diamond or diamond substitute. Diamond substitutes have only a limited application, so they will not be considered.

The Diamond. The diamond is the key to dependable and economical drilling so this element of a diamond bit will be considered first. Only two major types of diamonds have been used, originally the black diamond or carbonado from Brazil, and later also the crystalline diamond from Africa, commonly termed bort. The black diamond as used in a drilling bit is considerably larger than the bort diamond. Because of its large size, only a small number of black diamonds are used in a bit. Normally these diamonds are set in the bit blank manually, using, when desired, small quantities of soft metal to hold the diamonds in place. The bort diamonds are smaller in size and used in large numbers as shown in the accompanying illustration. A mechanical setting method is normally used, the stones being set in the bits by means of pouring or a sintering process. Poured bits are manufactured using a molten metal (or matrix) which is poured in such a manner that it joins diamonds to a steel bit blank, the diamonds being located in a predetermined manner on the surface of the bit. Sintered bits are usually formed by combining heat and pressure to a powdered metal in such a manner that diamonds are located in a random fashion throughout the powder, and are termed impregnated bits. The diamonds may also be located on the surface in a predetermined position as in the pouring process.

The Blank Bit and Matrix. In the manually set bits, annealed, cold-rolled steel is used. In the mechanically set bit, various compositions have been tried. Originally a copper-beryllium alloy was employed because the melting temperature is sufficiently low to permit pouring at a relatively low temperature. This method is still used extensively. More recently, harder alloys with slightly higher melting points have been used with notable success. These later types have produced a matrix or diamond-retaining metal considerably

REAMING SHELLS

harder than the earlier metals. This harder matrix can withstand abrasion in a drill hole much better than the original softer matrix. In the previously mentioned powdered metal process combinations including tungsten and nickel as the main ingredients have been used to develop matrices of varying degrees of hardness.

From the brief discussion above, thus it is evident that there are numerous combinations of materials which may be used in the manufacture of a diamond bit. No one combination of materials or method of manufacture will produce the most dependable and economical results under all drilling conditions. The selection of the best bit for a given job is therefore a prime consideration in its successful use and care. The character of the ground and rock, through which the bit will pass determines this selection. Soft, loose formations may normally be drilled most economically with larger and less expensive diamonds than those required for hard compact formations. Stones must be located in the bit so that they cover effectively the surface being drilled. The contour of the bit surface must be such that minimum wear, minimum loss of stones, and minimum reduction of gage will be realized. The matrix must be of such a hardness that in the case of the surface-set bit, the wear will be negligible, and in the case of the impregnated bit, the wear will be only sufficient to permit proper exposure of the diamonds.

Experience and Skill Requisite. The use of a diamond bit in a drill hole requires knowledge and skill. Careless drilling practices may result in crooked, inaccurate holes and loss of core. It is essential that a modern drill rig, designed to provide adequate speeds of rotation and proper rates of penetration, be applied with correct load. These factors are especially important when starting a hole, both from "dependability" and "economy" considerations. Too rapid penetration at the start of a hole results frequently in drifting as well as excessive wear on the bit. After a hole is started, these same costly results may be obtained, but to a slightly lesser degree. Throughout the drilling operation the proper use of a coolant is important. Usually the coolant is water. If the supply is inadequate, diamonds overheat, and the cuttings remain in the hole and wear the diamonds and matrix unnecessarily. Blocking of core in the bit results. The core recovery is then less reliable and the drilling much more expensive.

Selection of Equipment and Withdrawal for Resetting. From a cost viewpoint, careful selection of bit and drill rig together with adoption of the best drill practices are all ineffective if bits are not withdrawn for resetting at the proper time. As mentioned previously, the most rapid penetration of the drill bit is not always the most economical. Nor is the longest possible run with a drill bit always wise. Drilling work is usually performed on a cost-per-foot basis. This practice encourages rapid drilling and maximum use of a drill bit, particularly if long core barrels are used. A driller is reluctant to withdraw a bit in the middle of a run just because the bit appears to be running smooth. On a deep hole, time for this withdrawal and entry of a string of rods frequently exceeds drilling time. However, in order to secure the most dependable results at the lowest cost, all these factors must be balanced carefully. A decision must first be made as to the satisfactory standard for core recovery, and then drilling must progress so as to meet this objective. Labor, time, gasoline consumption, and equipment wear must then be balanced carefully against diamond loss, and resetting charges. The least expensive overall cost per foot of drilling while still realizing satisfactory core recovery is the final objective.

General Recommendations for Starting a New Hole. When starting a new hole the operator should, if possible, determine the approximate objective depth. If the hole is to be drilled beyond a depth of 1,000 feet, two reamer shells should be provided, and these should be used alternatively by changing shells every 50 ft. to insure that the loss in gage is kept uniform. For a hole to be drilled to a depth of 1,500 ft., the operator should start with three shells and alternate them. This will prevent such reaming of new bits which is costly in time and very destructive to the outside gage stones in the new bit.

Drilling Through Gravel or Loose Material. Diamond bits should never be used for drilling through gravel and other loose and unconsolidated material except when using special impregnated bits, or bits set with diamond chips especially for this purpose.

Reaming or Non-Coring Type drilling. If reamer or non-coring type drilling is being considered, the previous discussion on cost also applies. It is only necessary to substitute a consideration of accuracy or hole location for core recovery. In non-coring operations when blasting is the objective, it is frequently of prime importance that holes be drilled in carefully determined patterns. Speed of drilling alone is not the cost determinant, but rather tons of rock released per foot of drilling. If the objective of a non-coring operation is drainage, for example, it is frequently necessary to drill accurately for a considerable distance to locate a small shaft or tunnel. In these cases the accuracy or dependability factor outweighs cost. It should be emphasized that proper selection of a well-designed non-coring bit would greatly facilitate the successful completion of such an operation.

When drilling relatively deep holes, the reamer shells should be gaged frequently, and should be changed when their gage drops approximately .006 in. below their original set diameter. The shell should be taken out of service and replaced with a new one. The old shell may still be in good shape other than for gage loss, and some drillers have found that it can be used with undersized bits near the bottom of a deep hole. It can

also be used for shallow drilling.

Lubrication and Wash Out. When preparing to lower the drilling tools into the hole, the operator should be certain that the core barrel is clean and all threads lubricated. He should also make certain that the core lifter is free and in its proper position. The core barrel should be lubricated on the outside over its entire length with a good water-repellent, viscous grease. This will help to reduce vibration destructive to diamonds.

As the tools are lowered near the bottom, the operator should start circulation to wash out the settled cuttings which usually extend up some distance from the bottom.

Precautions When Part of Core Falls and in Certain Hard Rocks. Occasionally when the rods and core barrel are being withdrawn from the hole after a drilling run has been completed, a part of the core may slip through the lifter and fall to the bottom of the hole. In such cases, if the rock is at all hard the operator should chop out this core before putting the diamond bit back to bottom. Running the diamond bit over hard ore or loose chunks of caving in the hole is extremely destructive to the inside gage stones.

In drilling many kinds of hard rock, the bits lose outside gage rapidly without damage to the rest of the bit. When this occurs while drilling deep holes, these bits should be taken out of service, and replaced with new bits. Some drillers run out old bits at the bottom of a deep hole or near the bottom or for drilling shallow holes.

When drilling very hard, fine-grained, silicious rock, the diamond may polish after drilling only a few feet. When this happens, the diamond bit cannot be expected to make any further progress in that particular kind of rock, and should be removed from service and used later either in another hole or in that same hole in some different kind of formation. Very often a slight change in the grain or hardness of the formation will remove the polish from the stones and render the bit useful for much additional drilling.

When drilling through highly abrasive rock, there is a tendency for the metal to wear away from the stones. In these cases when the stones become exposed approximately one third of their size, the bits should be removed and reset. After one third of the bulk of each of the stones extends from the metal, there is danger of further wearing away of the metal to the point where the stones will drop out.

Dry Blocking in Soft Rock. So-called dry blocking is considered reasonably good practice while drilling relatively soft rock, but should not be followed in drilling hard rock as it is destructive to the diamonds.

Grinding of Core is Destructive. Grinding of core is another practice which rapidly destroys both the diamond-set bit and shell. In certain classes of drilling, cores are not required and operators resort to grinding or core rather than pulling the tools out of the hole each time the core blocks in the bit or barrel. Sometimes this may be economical, as the gain in footage may offset the higher cost of bits. Normally, however, in this class of work solid bits should be employed rather than core bits.

Removal of Bits from Barrel or Shell. When removing the diamond bit from the core barrel or core shell, great care should be taken to avoid allowing the wrench jaws to contact the diamonds. This is probably the most common abuse to which diamond bits are subjected. This also applies to connecting and disconnecting the reamer shell.

The Importance of Resetting. This consideration affects appreciably the total cost of diamond drilling. Three major elements determine the cost: replacement of damaged or lost stones, burning out and resetting the bit, and capital outlay required to carry on operations during resetting periods. This last item may become a major consideration if resetting facilities are not readily available and capable of giving prompt service. A proper assortment of spares on hand would eliminate much loss of time.

Storing of Diamond Bits and Shells. When diamond-set bits and shells are not in use they should be well oiled over their entire surfaces and packed in a separate box used only for that purpose. Each tool should be protected by waste, rags or other soft packing to prevent damage to the stones. Their value also suggests their being kept in a place free from danger of loss by theft.

Keeping Cost per Foot Constantly in View. Owners and supervisors can help to keep their diamond costs down by periodically calling to the attention of their operators the current cost per foot for diamonds. This practice will prevent the continuity of bad habits that develop from time to time. This helps to reduce diamond costs, and serves to make the operator do a little qualitative thinking on his own. This invariably makes for better over-all efficiency.

The Scope for Diamond Drilling. The scope of diamond drilling might well be considered. Normally diamond drill bits are used to drill holes and recover cores ranging up to four inches in diameter. Vertical holes larger than this are usually considered too expensive, although holes up to 8⅝ in. have proven economically feasible in certain formations. Normally holes larger than four inches in diameter are drilled with either churn drills or shot hole drills. However, these methods are practical only for substantially vertical holes. If large angle holes (any which are not vertical) are desired, the diamond bit once again is employed. Such diamond drill holes up to sixteen inches in diameter have been drilled. Large diamond drill holes have also been drilled recently in preference to shot drill or churn drill holes, where the operation is close to a mine shaft. It was believed that diamond drilling would disturb the shaft less than the other methods. It should also be mentioned that diamond drills are used for drilling exploration holes, blast holes, grouting holes, ventilation holes, drainage holes as well as in various phases of quarrying and oil field drilling.

To Summarize. The use and care of all diamond drilling bits is dependent upon a careful selection of the properly designed and manufactured bit, skillful and efficient use of a modern drill rig and equipment, and the accurate determination of the bit changing time. All these factors must be weighed so as to maintain the proper balance between dependable and economical drilling.

None of the recommendations set forth herein are intended to substitute for the judgment of good, qualified drillers, but it is hoped they may be of some help to those carrying out diamond drill work and employing other than skilled operators.

CONE CLASSIFIERS AND SETTLING TANK at New Riverside Ochre Co.'s plant. At the right is seen the section containing the steam drying, grinding, and sacking section

Cartersville Ocher Seeks New Peacetime Uses

E. DALTON WHITE, Rhodes-Haverty Building, Atlanta, Ga.

IN GEORGIA the position of ocher as one of the State's principal mineral products has been maintained by unceasing efforts to improve its quality in respect to purity and color. The Cartersville district has had the most important deposits, and from these, beginning in 1877, ocher has been supplied to both the domestic and export markets, for making pigments, linoleum, and similar products, and also for coloring mortar and for use as an admix in concrete. The New Riverside Ochre Co., J. R. Dellinger managing partner, has been one of the principal producers. This company also mines and processes barytes. W. B. Hawkins, Jr., is assistant manager and J. H. Cobb, general superintendent.

Inasmuch as ocher must compete with other materials in paint and linoleum, and in other products, tests for quality and color are highly important. New Riverside's chemical laboratory is under the supervision of L. L. Kown, chemist.

The ocher is analyzed for Fe_2O_3 content, mesh size, color, and moisture. Iron content is determined by the potassium bichromate titration method; mesh size by screening and determining the percentage of minus-325 mesh. Color is determined by mixing a weighed amount in linseed oil and comparing against a weighted amount of a set color standard on a glass slide. Moisture is determined by the usual method of heating a weighed sample and ascertaining the percent loss.

The Finished Product

Analyses of the processed ocher from the New Riverside plant shows the following: Fe_2O_3, 58 to 60%; SiO_2, 15 to 20; Al_2O_3, 6; H_2O, 2; MnO_2, 0.7; alkalies, 0.7; organic matter (loss on ignition) 10; and minus-325 mesh 99.5%. Alkalies may be calcium or magnesium carbonates. Normally the percentage of these is low, as little is found in the ocher deposits.

The yellow ocher deposits of the district are limited to the Weisner quartzite of Lower Cambrian Age and occur chiefly in a belt about 18 miles long and 2 miles wide. The formation shows considerable variation in composition and in texture, with color varying from dark to light. Where ocher replaces the shaly beds, it is darker, due to a larger content of clay which cannot be separated. Where it replaces the quartzite, it carries less clay and is uniformly lighter. The latter is in greater demand. Production is controlled by mining only the deposits which meet standards.

Barytes, or barite, is found in all the ocher deposits. The barite operations have disclosed ocher seams which are now being worked in the sides of the open cuts.

The New Riverside company has extensive ocher properties of its own and purchases crude ocher from others. It does not do its own mining, but allows independent miners to work its deposits and purchases their output on the basis of sales contract requirements. The independents furnish labor and equipment and truck their output to the company's bullpens.

Mining is simple and is done by driving tunnels 3 to 4 ft. wide and 8 ft. high into the deposits. Where the ocher has been exposed in barytes workings, tunnels will be started at different levels, and slides, or chutes, built to deliver the ocher to the truck-loading bins.

At the plant the crude ocher is washed in a single log washer with

FLOWSHEET used by New Riverside company in preparing ocher

water at 90 to 95 lb. from a 3-in. Gardner-Denver pump. The overflow carrying the ocher and fine sand in suspension is flumed to three cones 7 ft. high and 4 ft. diameter at the top and 10 in. at the bottom. Cone overflow goes to a 40-ft. settling tank and the underflow to a Dorr classifier, the overflow of which goes to the same tank.

The ocher settles in the latter and is then transferred by a Gould diaphragm pump to a smaller tempering tank at the top of the dryer building. From this it is fed to four Buffalo-type (drum) steam dryers. When dried, the ocher is scraped off and taken by screw conveyor and elevator to overhead storage bins.

This ocher contains some small lumps and in consequence is sent to a Raymond Imp mill grinding to 99.5% minus-325 mesh. It is then elevated to packing bins and sacked for shipment in 50- and 100-lb. heavy kraft paper bags by an Atlanta Utility packer. These bags are closed with a Union Special sewing machine.

Present packing capacity is about 40 tons per 10-hr. day. Monthly production capacity is about 1,000 tons per month on a 24-hr. seven-day-week basis.

Mill water for washing both ocher and barytes is drawn from the Etowah River, which is about 600 ft. from the plant, by a 5-in. Manistee pump. The water system supplies the ocher operations as well as the barytes operations.

Steam for the dryers is furnished by a natural-gas-fired, automatically controlled, 150-hp. boiler, which gives steam at 110 to 125 lb. The drums are driven from a line shaft operated by a 10-hp. motor. Drum speed is regulated so that the ocher will contain only 2 percent moisture or less.

The crude ocher runs about 40% Fe_2O_3 and the concentrate 55 to 58% Fe_2O_3, with a screen analysis of 99.8% minus-325 mesh. The concentrate will carry silica and alumina.

During each run, two or three tests are made to check for color, moisture. Fe_2O_3 content, and particle size. The Fe_2O_3 is roughly controlled at the mine by keeping operations within the richest portions of the deposits, and the silica content in the course of the washing and settling.

Waste rock and crude iron ore from the washer are stocked for use on the company's roads. There is not enough of these products to warrant looking for an outlet for their disposal.

Sand and silica in the cone underflow are put through a rake classifier and stocked. At present there is no commercial use for this ocher-bearing sand, although some years ago it was used as a filler and for coloring fertilizers.

During the war ocher production soared to record levels, as the Government needed large quantities for camouflage paint for equipment and clothing. With peace the production has returned to its former levels. Activity in ocher production is expected to increase as economic conditions in foreign countries improve and shortages of many domestic products are eliminated. Much experimenting is under way, which foreshadows new and wider uses of the product.

Safety Codes Will Work If Responsibility Is Fixed

DRURY A. PIFER, Mining Engineer, Seattle, Washington

On the entire operating personnel of a mine rests the duty of seeing that the regulations are enforced

WIDE PUBLICITY given to the Centralia mine disaster, with charges and counter charges as to responsibility, has turned attention dramatically to the need for taking a sterner attitude toward the enforcement of mine safety programs. Under an adequate program there would be no need to cry "irresponsible" and "callous" following each disaster; the responsibility for certain conditions and procedures would be definitely fixed. Following an accident, only a routine investigation would be necessary to determine whether or not there had been neglect of duty, and if neglect was proven, legal penalties could be imposed upon the persons responsible. The way such a law operates for the mutual benefit of all persons engaged in mining is ably demonstrated in the application of the Mines and Works Act in South Africa. Similar legislation is in effect in the United Kingdom.

The fine work of the United States Bureau of Mines in recording and promulgating safe practices and the Bureau's analyses of the causes of mine accidents provide an unparalleled body of information upon which to base similar codes in the United States. It appears negligent to overlook this basic informa-

tion and not to use it to enact legislation providing for a complete uniform safety code. Apart from the details of safe measures and practices, such a code should fix definite responsibility for enforcing its provisions and penalties for not complying. Also it should establish an inspectorate to examine mines periodically and investigate cases arising from breaches of the code.

Legally Responsible

Every individual engaged in working in a mine should have definite legal responsibility for abiding by the provisions of the code pertaining to his field of performance. Labor and management both have a high responsibility for safety, and each individual in those groups should accept the responsibility related to his duties. The miner must conform to predetermined safe practice or suffer the penalty for non-compliance. The same applies to all other employees. Disciplinary action for a safety code violation should be mandatory. Thus the guilty party would not be able to shelter behind any organization to avoid the discipline.

Responsibility for enforcing the regulations should rest with the operating personnel of each mine. The code should require each employee to report all breaches which come to his attention from within the area of his duties and responsibilities. Failure to report such a breach should itself be a violation. Each official should be responsible for the observance of the code by those employees working under him. These provisions legalize the ordinary procedures which are used to enforce mine safety rules but which so often are not employed because of the resistance to disciplinary action offered by the workers and the unions. Essential to this scheme is the precept that negligence of an employee does not relieve his superior of responsibility.

It should be within the power of the manager to impose within fixed limits penalties upon an offender when he admits guilt of an alleged breach. When guilt is not admitted, the accusation should be investigated by an inspector who should have penalizing authority. The right of appeal to the courts from the inspector's decision should be provided. In the event of an accident it should be the inspector's duty to determine whether or not the code has been violated. Penalties should take the form of fines and, when circumstances warrant, the withdrawal of the right to assume certain responsibilities in the mine.

The method outlined for enforcing the code fixes the main burden on the operating staff of the mine, and has the advantage of reducing to a minimum the number of inspectors required. If the details of enforcement were left entirely to the efforts of the members of the inspectorate, the inspectors would soon degenerate into a mere policing organization and the number required for even inadequate enforcement would be prohibitive.

Under present agreements the unions have the right to protest unsafe conditions or practices, but there is no assurance that such conditions will be reported. Often the unsafe condition is the manner in which work is performed. Safety committees and individual worker seldom report such things. An employee working carelessly is usually performing in a way he thinks easiest for him. Therefore he cannot be expected to ask for conditions that will cause him inconvenience, even though his personal safety is advanced. Hence, reports of unsafe conditions are usually limited to complaints of management's practices. A safety code detailing the manner in which certain work is to be done and imposing personal responsibility upon the one doing the work should go far toward improving these conditions.

It is important that provisions be made for the imposition of penalties. The power only to recommend and suggest is ineffectual when the parties subject to the suggestions do not follow them. Reluctance to follow recommendations may occur when additional costs are incurred, production suffers, or personal inconvenience is caused. A personal penalty for non-compliance encourages a more aggressive attitude toward safety.

Flexible Code Desired

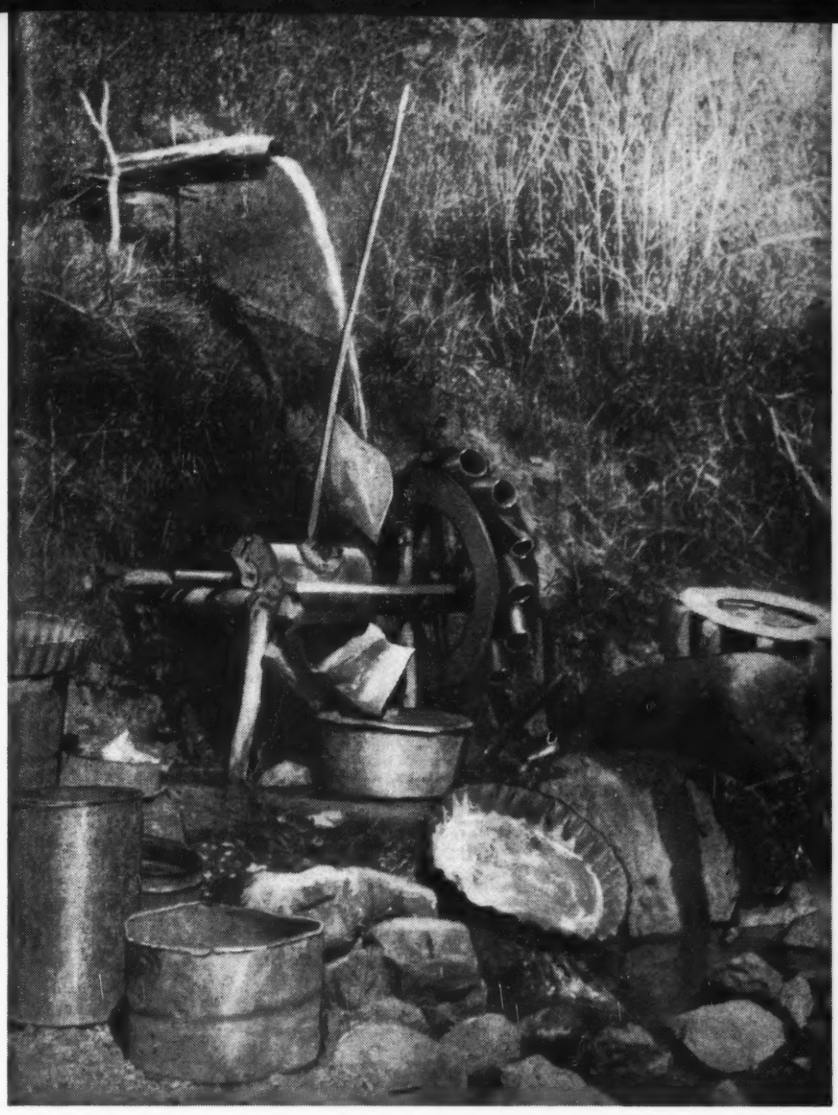
In order that the code remain flexible and conform with new developments the regulations should be subject to change without resort to legislative act. It is suggested that upon recommendation of some official or board, and with approval of a senior government official, changes and additions should be easy to make. Flexibility is necessary to avoid static regulations which ultimately would hinder rather than aid industrial safety and development. It would be the privilege and duty of all members of the industry to assist the work of the administration by recommending appropriate measures, and to join in the development of fair and practical regulations.

The proposed regulations should be strictly a code for safety, and in no way impose on phases of operation other than safety. Details which can appropriately be regulated are well known. It is strongly recommended that the manner of working and keeping places safe be controlled.

Examinations Useful

Everyone subject to the code should be familiar with the details applicable to his work. This can best be accomplished by some form of examination. In the several mining districts small committees consisting of representatives from the groups concerned should give strict oral or written examinations on several levels of responsibility. Candidates demonstrating competent knowledge of the regulations and of their practical application to local conditions should be given a certificate. Possession of such a certificate should be a prerequisite to employment.

Most mine accidents are caused by negligence or ignorance of safe working methods. Education campaigns are not the whole answer. The mine worker must assume a responsible attitude toward the elimination of such accidents. It is unlikely that he will do so of his own initiative. Therefore, the responsibility which is now his in reality must become his in legal fact. The duty of mine inspectors lies in bringing to light unsafe practices, recommending safe methods and equipment, enforcing the provisions of a safety code and investigating accidents and breaches of the code. It is the duty of management to instruct in safe practices and to provide the necessary materials and equipment to maintain safe conditions. It is the duty of the man at the face to prevent minor as well as major accidents by working in a manner known to be safe. All too often the miner is the individual who is most careless in disregarding measures promulgated for his safety. Adequate regulations placing personal responsibility on all personnel would advance safety.



THIS HOME-MADE BALL MILL for recovering the free gold from ore taken from rich stringers attests the native Igorot's ingenuity

Recovering Gold the Hard Way

Nestorio N. Lim, Philippine Bureau of Mines, Manila, P. I.

DURING THE WAR gold mining in the Baguio area in Mountain Province of the Philippine Islands was at a standstill. Aside from operating the Lepanto Consolidated copper deposits at Mancayan, 100 km. north of Baguio, the Japanese made no effort to work the important gold producers of the district. Approximately 12,000 native miners had to make a living by other means for the period of the occupation.

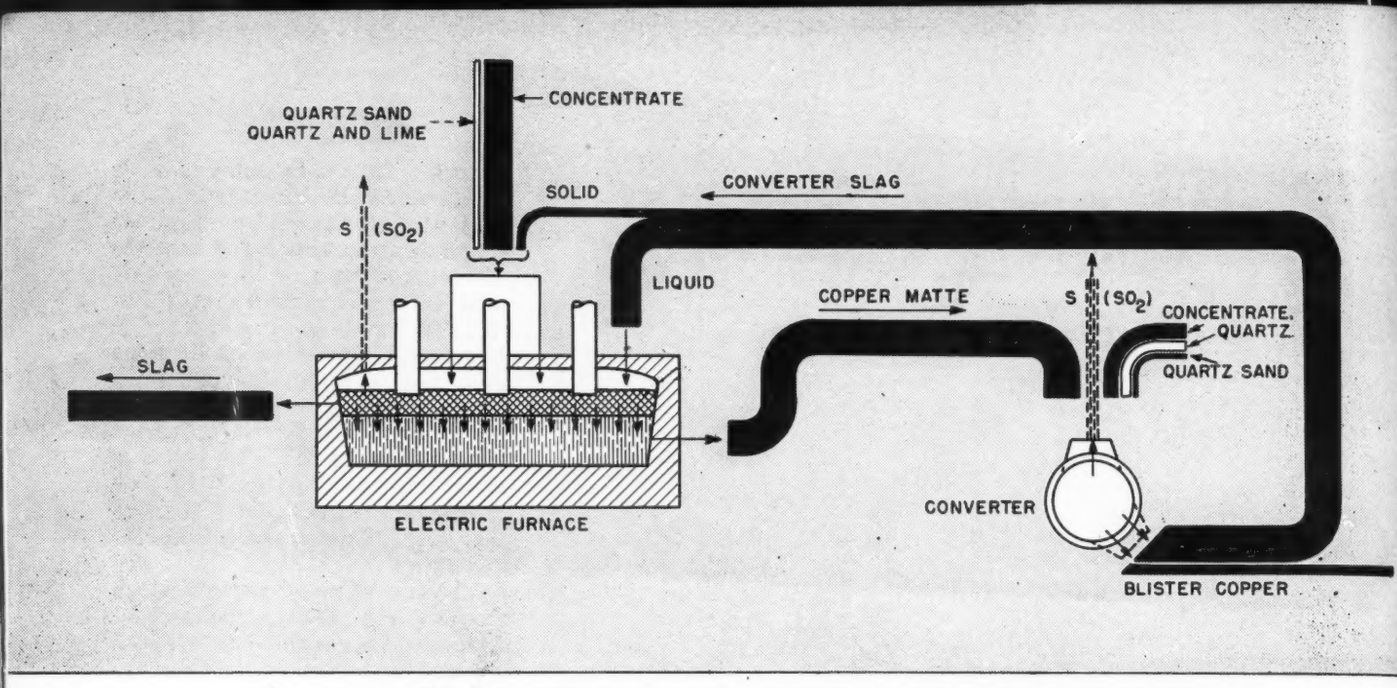
The Igorots of Mountain Province, gold miners for centuries, are extremely skillful prospectors and have much native ingenuity in devising crude appliances for recovering gold. During the war a considerable number of these men turned to prospecting for rich stringers of gold ore that are not uncommon in the Baguio field. No doubt others high-graded some of the rich veins of Benguet, Balatoc, Big Wedge and Itogon, literally right under the eyes of the Japanese guards. It has been reported that theft of high-grade ore during the war at the Big Wedge mine was especially heavy. How this ore was brought out without power, explosives, hoisting, or tramming remains a mystery.

Naturally the mining operations were on a very small scale as all work had to be done by hand. Ore recovered by high-grading or from more legitimate work—in wartime the distinction may have been academic—was first hand-crushed by hammers from ¼-in. to ⅛-in. size, and panned in large corrugated iron pans, of the kind used by *lavanderas* for washing clothes. Some gold was recovered at once.

The washed gravel was then placed in a home-made ball mill, the cylinder of which was made from any available tank or pipe of a diameter ranging from 12 to 18 in. The length of the cylinder varied from 12 to 22 in. The two end pieces were cut from any plain iron sheet available, with a thickness of ¼ to ½ in. These were soldered to the cylinder. A hole was bored though the center of each end piece, and a shaft of 2-in. round iron inserted, extending the length of the mill and projecting from both ends. A flywheel which acted as a waterwheel, usually consisting of an old motor car wheel, was attached to the shaft, and boxes were built on it, about 6 in. across and 6 in. deep. Water from a flume was made to flow against the waterwheel, providing power for grinding. The mill made about 30 r.p.m. Flume width was the same as the width of the boxes on the wheel.

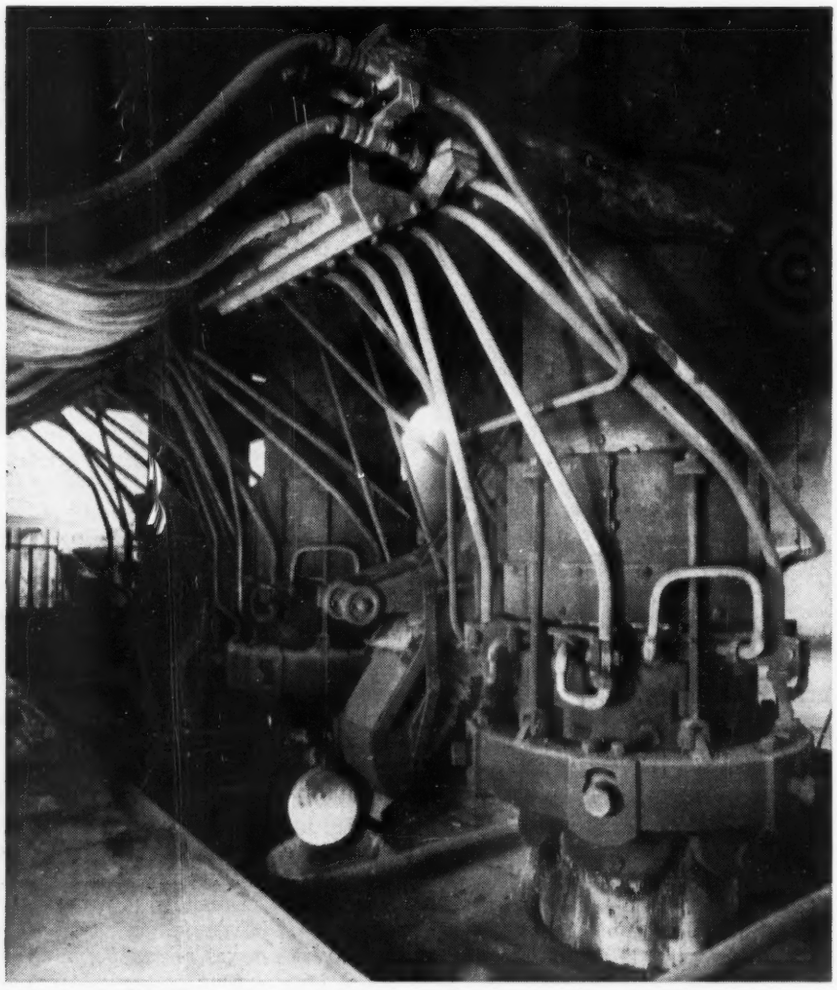
Still used in places, the mill is operated as follows: Ore is fed into the tank through a rectangular 4 x 6-in. opening in the middle of the mill, which is closed with a removable top lined with rubber to prevent leakage before being bolted into place. Steel balls, 2 in. in diameter, are used for grinding. The mill is filled to about 80% of its capacity with ore, steel balls, and water. The feed is ground to 20 mesh, and sometimes finer, after two or three hours. A mill large enough to hold 55 gal. will take about 1,000 lb. of ore.

When grinding is finished, the tank is opened and the sludge poured in a tub, removed to a sluice box, and the gold and concentrates are recovered by panning in a batea. No attempt is made to amalgamate and only the free gold is saved. Obviously the losses are large, but the operations appear to provide a living. The gold is sold in the open market in Manila.



SULITJELMA'S three-phase copper-matte smelting furnace is operated as shown in this diagram

Electric Smelting Points



THE THREE ELECTRODES of Outokumpu's nickel-matte furnace. Transformer capacity is 2400 kva. The furnace is used alternately for nickel and copper concentrates.

New methods of recovering SO_2 or sulphur in connection with electric smelting offer metallurgical plants new possibilities

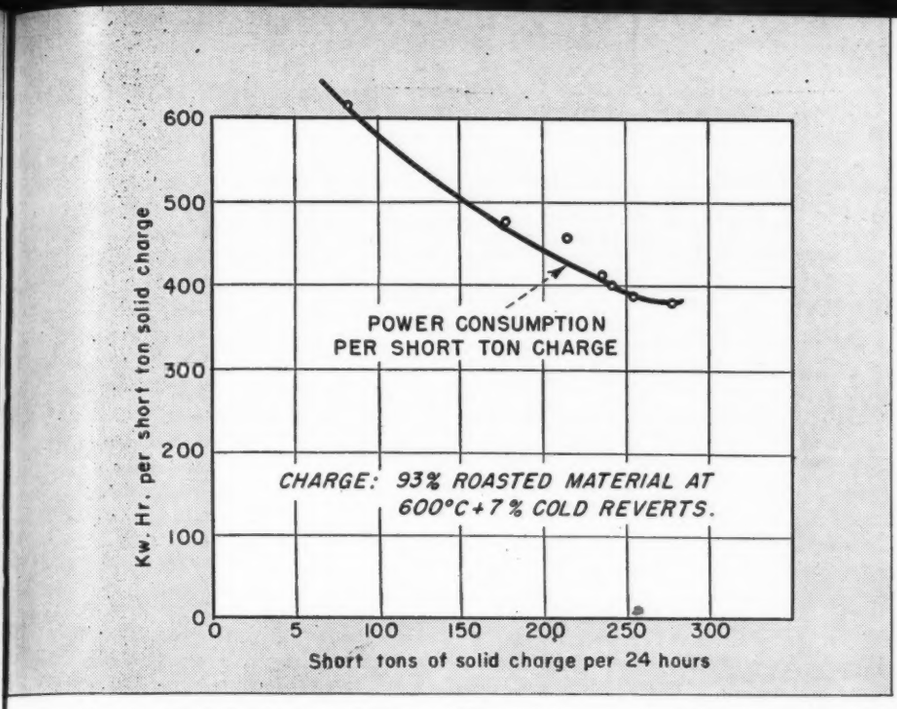
METALLURGICAL TREATMENT of flotation concentrates made from copper and copper-nickel ores usually comprises: (1) roasting; (2) matte smelting; and (3) converter blowing.

Matte smelting, with which this article deals, can be carried out in an electric matte furnace, as well as in the more familiar reverberatory furnace.

As will be shown, a number of electric matte-smelting furnaces with transformer capacities from 2,400 to 12,000 kva. have been built in Finland, Norway and Sweden. These have smelted up to 450 tons of solid charge per 24 hours per unit. Furnaces with a capacity of 600 to 1,000 tons per 24 hours are being planned.

Electric matte furnaces may be circular or they may be shaped like the conventional reverberatory by arranging, for instance, six electrodes in line. Old reverberatory furnaces may economically be rebuilt for electric heating.

Sulphur dioxide, as will be further shown, may be recovered economically from a relatively small volume of concentrated gases, with the use of the electric furnace.



POWER CONSUMPTION of Boliden's 4,000-kva. furnace at different smelting rates

Way to Lower Cost

DR. M. SEM and F. C. COLLIN,

Elektrokemisk A. S., U. S. A. Branch, 101 Park Avenue, New York

Power consumption by these furnaces is low, due to high thermal efficiency, and electrode consumption is small.

Operation of the electric matte furnaces is mechanized, and is simple and reliable. Maintenance and repair costs are negligible.

From Slow Beginnings

Start at Sulitjelma. During World War I, electric smelting for the production of copper was recommended by a number of metallurgists. In the United States, Messrs. Lyon and Keeney and Prof. J. W. Richards were contemplating such methods. Another pioneer was Prof. Borchers, of Aachen, Germany.

Although electric copper smelting in principle was accepted by the leading theoretical metallurgists, the industry was still hesitant in practicing this method on an industrial scale. Producers were not interested in small electric furnaces. To keep labor costs down, they needed large units and the electric furnace was not then developed sufficiently to fulfill this demand.

Jens Westly, then in charge of Sulitjelma Copper Works in north Norway, started his first experiment in 1912, using a furnace with a deep slag bath 20 to 32 in. thick. He introduced electricity into the slag bath through electrodes placed relatively far apart and with low current load. Thus, a pure resistance heating was established, without superheating the slag near the electrodes. This furnace offered excellent operating conditions for matte smelting. Due to the low voltage and the resistance heating which was possible without forming arcs, its operation was steady and frequent regulation of the electrodes was not required. It was necessary only to lower the electrodes from time to time as they were consumed. The slag was the hottest part of the furnace. It therefore had a low viscosity, and efficient separation of matte and slag resulted.

Heat transfer between the slag and the solid charge was also excellent due to the turbulent flow set up by the electric current in the slag. The charge was introduced through openings in the roof along the walls and thereby protected the furnace-wall lining. In the Westly furnace the temperature of the gas was only 400 to 600 deg. C., and there was no radiation on to the furnace roof from the electrodes. The roof, as well as the furnace lining, therefore, had a practically unlimited life. In the reverberatory, in contrast, the roof is subjected to the heat of the combustion flame.[1,2]

Electrodes Improved

These results obtained with six small prebaked electrodes arranged in line were promising. However, the mines were closed down for several years and not until 1928, when the present Sulitjelma furnace was built, was the method adopted on a large scale. The new furnace was designed by Westly (of Det Norske Aktieselskab for Elektrokemisk Industri, Oslo), in cooperation with the engineering staffs of Sulitjelma and Elektrokemisk, and based on the use of self-baking Soderberg electrodes, which it is said made the construction of this larger furnace possible.

The new furnace is a three-phase unit provided with mechanical charging. Transformer capacity is 3,000 kva. The three Soderberg electrodes, placed in line, have a diameter of 34 in. each. The furnace has proved reliable, having operated continuously without shutdown for several years. A flow sheet of the Sulitjelma process is shown. A flotation concentrate containing 20 to 25% copper is smelted without roasting. A matte is produced which is converted to blister. Yearly production amounts to 5,500 to 6,500 tons of copper of approximately 99.1% copper. As the roasting is omitted, a large amount of slag formed in the converter is returned to the matte furnace. Despite this, by continuous operation the power consumption is only 530 kw.hr. per short ton of solid charge fed to the electric furnace.

Electrode consumption is reported as 5 to 6 lb. of raw paste per ton total charge. This remarkably low figure in copper smelting, as compared with other kinds of electric smelting, is due to the special conditions prevailing in the matte-smelting process. The ampere load on the electrodes is low and there is not the usual strong tendency for

[1] "Electric Smelting With the Westly Furnace." By M. Sem. E. & M. J., Vol. 140, No. 47, 1939.

[2] "Litt. om Kobbersmeltninger i Sulitjelma." By L. L. Hagen. Tidsskrift for Kjemi, Bergvesen og Metallurgi, 1, 100 (1941).

Heat Balance for 9000-kva. Outokumpu Furnace

FURNACE CHARGE:

34 to 48% raw concentrate — 20 to 25% Cu, 31 to 34% Fe, 35 to 36% S,
40 to 31% roasted concentrate — 22 to 27% Cu, 36 to 39% Fe, 5 to 6% S
13 to 16% " tailings " — 90% SiO_2, 0.3% Cu, 3.5% Fe, 2.8% S,
6 to 8% limestone — 52% CaO, 7% SiO_2

ADDITIONAL CHARGE: 12 to 20% solid slag, flue dust, etc. Liquid converter slag.

Furnace load,	5,300 kw.
Solid charge per 24 hr.,	268 tons
Power consumption per ton,	475 kw. hr.

HEAT BALANCE PER TON OF SOLID CHARGE:

Credit per ton solid charge:	
Exothermal reactions,	165 kw. hr.
Heat in converter slag,	37 kw. hr.
	202 kw. hr.
Debit per ton solid charge:	
Endothermal reactions,	77 kw. hr.
Evaporation of water,	37 " "
Heat in matte,	92 " "
Heat in slag,	197 " "
Heat in gases,	125 " "
	528 " "
Heat deficit = 528 − 202 =	326 kw. hr.
Actual power consumption:	475 kw. hr.
Furnace efficiency* = 326 ÷ 475 × 100 = 68.5%	

* Including electrical losses in transformers, bus bars, etc.

the electrode carbon to react with the slag. It was also observed that electrode consumption with the Soderberg electrode was much lower than when using pre-baked electrodes. This is due to the protection given by the steel casting which prevents corrosion of the electrode above the slag line.

This furnace is reported to have been in operation for nine years without any repairs to the furnace lining.

Some U. S. Furnaces

Meanwhile, Elektrokemisk had in 1925 participated as consultants in building a 2,000-kw. furnace, equipped with three Soderberg electrodes, at Great Falls, Mont. This furnace ran a year producing zinc, lead and copper from slag. Zinc and most of the lead were volatilized and oxidized into oxides and recovered in bag filters. The smelting was satisfactory, but the furnace was shut down later as it was found that the slag could be charged directly in a liquid state into a furnace of the converter type fired with coal powder.

Another electric furnace with Soderberg electrodes designed by Elektrokemisk was built in 1928 for production of tin-lead alloy at U. S. Metals Refining Co. in Carteret, N. J. The furnace was operated with a load of 1,500 kw. and equipped with three Soderberg electrodes 28 in. in diameter. The raw material was residue from copper extraction. Due to the lead vapors evolved, the furnace had to be made tightly closed. Electrode openings, as well as the charge openings in the furnace roof, had to be designed with special care.

Two developments. Despite the good performance of the installations described, the development of electric copper smelting advanced slowly. In the ten years prior to World War II, however, two developments have changed the situation, namely:

1. Knowledge as to building large electric smelting furnaces has increased materially, so that such furnaces can now be built of a capacity comparable with that of the small reverberatory.

2. New methods recently developed for recovering SO_2 in smelter gases have made it desirable—in many cases necessary—to utilize the gases. The economic possibility is, however, to a great extent dependent on the concentration of SO_2 in the gases. A higher concentration is possible in an electric furnace where the sulphur dioxide is not diluted with gases of combustion.

An important point in connection with electric matte smelting is the small volume of gas evolved. Theoretically, the gases formed are mainly SO_2 with small amounts of CO_2. Not considering the small amount of air contained in the charge, the sulphur concentration in the gas, therefore, depends entirely on the design of the smelting furnace. If care is taken to avoid leakage of air into the furnace, a concentrated gas is obtained, which, mixed with the converter gases, may be completely cleaned with recovery of SO_2. In such a way the gases may be made harmless, thus avoiding damage to vegetation.

A Finnish Installation

These were the decisive factors for Outokumpu Oy, the largest copper producer in Finland. In 1934 they decided to erect works at Imatra for smelting copper concentrate previously exported to Germany. Outokumpu has deposits containing more than 7,000,000 tons of ore running 4 to 4½% copper. The smelter was located at Imatra near the large hydro-electric power station. The surroundings being a typical woodland area, it was impossible to let the gases escape without cleaning. After thorough study, it was decided to use a combination of electric smelting and recovery of SO_2 from the gases according to the absorption method of Imperial Chemical Industries Ltd. Elektrokemisk was then given the interesting task (in cooperation with Mr. Westly) of designing the largest closed electric furnace[3] built at that time.

A Large Closed Furnace

The furnace is circular and of 33 ft. outside diameter. The three Soderberg electrodes are placed in a triangle, each being 56 in. in diameter and weighing approximately 15 tons. Mechanical charging from overhead hoppers has been provided. The magnesite lining of the furnace carries separate tapping holes for slag and matte. Slag may flow continuously, whereas the matte is tapped intermittently into a ladle through water-cooled tapping holes.

Transformer capacity is 9,000 kva. The furnace has been operated with 220 to 450 tons per 24 hours of solid feed at a load of 5,000 to 8,000 kw. Power consumption is approximately 460 kw.hr. per ton of solid charge or 4,500 to 5,500 kw.hr. per ton of copper. Electrode consumption is generally between 4 and 6 lb. per ton of solid charge.

Raw materials smelted are a mixture of copper concentrate containing about 20% copper and a roasted

[3] "Outokumpu Mine and Smelter, Finland," By Eero Mäkinen, Mining and Metallurgy, Feb. 1938.

concentrate running 20 to 23% copper. The matte contains 38 to 45% copper and the slag 0.3 to 0.6% copper depending on the concentration of copper in the matte. Blister is produced by blowing the matte in horizontal converters, of which there are three, one being a spare. The blister copper contains 99% copper, ½ oz. gold and 5 oz. silver per ton of copper.

The Heat Balance

In an accompanying tabulation is given the heat balance for Outokumpu's 9,000-kva. matte furnace, based on measurements and calculations by Mr. Toivanen.

This calculated efficiency for electric smelting is relatively low as compared to certain other types of closed furnace operations, but excellent as compared to reverberatory matte smelting. For electric pig-iron furnaces, for instance, the efficiency of a 12,000-kva. furnace is 75 to 80%, although the smelting temperature is higher.

It should be borne in mind, however, that the Outokumpu furnace is operating on raw concentrate containing 5 to 10% H_2O which requires 37 kw.hr. per ton charge for evaporation. Also 125 kw.hr. per ton is lost in the gases, of which 95% represents outside air sucked in through the furnace roof. The actual furnace gas—SO_2 and CO_2 from the smelting process—amounts to about 1,600 cu. ft. per ton of charge. This small volume carries heat equal to 15 kw.hr. per ton of charge. Accordingly, the operation of a really "closed" furnace on dry charge, under Outokumpu conditions, would demand a power consumption of only 328 kw.hr.

The mixed gases from the electric matte furnace and the converters average 5 or 6% SO_2. The washed and cooled smelter gases were absorbed in a solution of basic aluminum sulphate, which dissolves the SO_2, the remaining air and carbon dioxide in the raw gas leaving through the stack. After the saturated liquid was first heated in heat exchangers by hot return liquid, the SO_2 was stripped with steam, dried and compressed to very pure liquid form. The SO_2 plant had a capacity of 50 tons per 24 hours.

The gas from the matte furnace at Outokumpu contains up to 10% SO_2, but, under average conditions, the concentration varied between 2 and 5%. This rather unsatisfactory result is due to the local operating conditions. The raw copper flotation concentrate contains much moisture at times. When this drops into the slag bath, a sudden outburst of large amounts of gases occurs. This causes a sudden increase in the gas pressure in the furnace and the strong SO_2-containing gas is partly pressed out through openings in the furnace roof. This is a nuisance to the furnace personnel and, to prevent it a suction is established in the furnace, whereby large amounts of false air are drawn in, diluting the gases. When operating with a dried or pre-roasted copper concentrate, the conditions will be different and, by careful closing of the openings in the furnace roof, a high concentration of SO_2, theoretically approaching 100%, should be obtainable.

Outokumpu's copper smelter at Imatra was transferred to Harjavalta, western Finland during the war.

Boliden's Furnace

In 1941 Elektrokemisk furnished the design of a 4,000-kva. smelting furnace which was installed by Boliden Mining Co. at Ronnskar, Sweden. The furnace is of the Westly type, rectangular with four electrodes in line, three of 40-in. diameter and one of 16-in. diameter. The furnace was originally designed for smelting lead concentrate, but has actually been used for smelting ordinary copper matte. Recently its smelting area was enlarged to permit full use of the transformers' capacity (up to 5,000 kva.) A flotation concentrate, containing 25% copper, is pre-roasted for partial elimination of sulphur down to 10 to 15% S. The hot calcines are fed by feed pipes through the furnace roof and smelted into a matte containing approximately 45 to 55% copper. The power consumption at different smelting rates is shown on the diagram where the power consumption in kilowatt-hours per ton solid charge is plotted versus tons of solid charge smelted per 24 hours. The curve illustrates how the specific power consumption decreases as the smelting rate is intensified. At full load, the tonnage smelted is about 280 per 24 hours at a specific power consumption of 375 kw.hr., but certainly the slag losses also increase at intensified smelting. However, the high capacity of this relatively small furnace demonstrates the benefit of smelting calcines as compared with raw wet concentrates. The furnace is convenient to operate as the charge is smoothly digested by the deep slag bath and boiling of the slag seldom occurs.

It is worth mentioning that in 1940 Elektrokemisk made a design for electrifying a reverberatory for the Boliden company. The furnace was to be equipped with six electrodes in line and have a transformer capacity of 12,000 kva. It was not built during the war, but the Boliden company has recently decided to erect a new 12,000-kva. matte furnace of the Westly type which they designed with the Elektrokemisk company's assistance.

Electric Smelting Also For Nickel-Copper Matte

As for the copper ores, the metallurgical processing of nickel-copper sulphide ores usually involves three steps: Preliminary roasting, matte smelting, and converter blowing. In the last step a low-grade matte containing 10 to 15% nickel is blown in converters to a concentrated matte containing 50% nickel, which represents the raw material for electrolytic refining of nickel.

Before World War II, the Mond Nickel Co. affiliated with International Nickel Company of Canada Ltd., acquired the rich Petsamo nickel deposits in northern Finland. The Elektrokemisk company, as consultant, designed the electric parts of the installations and the Soderberg electrodes of two 12,000-kva. matte-smelting furnaces. That design was completed in 1939, but during the Finnish-Russian war that year and the early part of 1940, Petsamo came into the actual battle zone and the construction of the smelter was abandoned. Later, the Petsamo Nikkeli Oy was put under the control of the Finnish Government which built up and started the operation of the two matte furnaces in 1943.

At Petsamo the ore is pyrrhotite containing serpentine. It was hand-picked and smelted directly, without flotation or pre-roasting, since it was not amenable to concentration by flotation. Suitable limestone for fluxing the magnesia was not available during the early period and the slag has a melting point of about 200 deg. C. above the normal for matte smelting. This fact made

it imperative not to do the smelting in flame-heated reverberatories, due to excessive temperature strain on the roof. However, this high melting temperature of the slag decreased the furnace capacity and called for 650 to 700 kw.hr. per ton feed for smelting energy. Even then the capacity was about 380 to 390 tons solid charge per 24 hours for each furnace.

With a pre-roasted nickel-copper concentrate and a normal slag temperature of 1,100 to 1,200 deg. C., we figure the power consumption per ton of solid charge to be about 320 kw. hr., or a smelting capacity of about 750 tons per 24 hours for a 12,000-kva. furnace.

Elektrokemisk has also designed a nickel-matte furnace for Outokumpu Oy. This new furnace was equipped with 2,400-kva. transformer capacity and used alternatively for smelting copper and nickel concentrates. About 100 tons of solid charge was smelted per 24 hours.

SO_2 Recovery Economics

Previously it has been said that an economical recovery of SO_2 from the gases in many cases is decisive for the establishment of new smelting plants. Reverberatory smelting produces large volumes of gases containing 0.5 to 1.5% SO_2 which cannot be recovered economically. In an electric matte furnace a concentrated SO_2 is formed during the smelting, which, by thoroughly closing the furnace, may be drawn off at high SO_2 content. The possibilities of the electric furnace have not yet been fully utilized at Outokumpu and other installations inasmuch as a wet concentrate was fed in these cases, which made operation with a completely closed furnace difficult. Taking into consideration present experience in design and operation of closed pig-iron furnaces and furnaces for smelting lead ores and residues, we are of the opinion that, by smelting dry raw materials and carefully closing the furnace, a furnace gas containing mainly SO_2 is undoubtedly obtainable.

In modern roasting practice an SO_2 concentration in the gas of 8 to 10% is realized. As to converter gases, experience at Outokumpu and Boliden proves that, by construction of suitable tight-fitting hoods over the converters in connection with suitable timing of the blowing schedule of two or more converters, a concentration of 7 to 10% SO_2 is obtainable. It is, therefore, possible to figure an SO_2 concentration above 10% in the mixed gases from a smelting plant processing sulphide ores electrically.

Such gases lend themselves excellently to a profitable production of sulphuric acid where there is a market for it. Alternatively, liquid SO_2 may be produced with reasonable costs from such concentrated gases.

Other Recovery Processes

The I.C.I. aluminum sulphate absorption process previously used in Finland has already been referred to. At Trail, B. C., SO_2 is recovered from large volumes of diluted gases by absorption in ammonia and production of ammonium sulphate and elemental sulphur. The German firm, Lurgi-Gesellschaft für Chemie and Hüttenwesen, developed the so-called "Sulfidin" absorption process, where a mixture of xylidine and water is used as absorbent. This process was used in a test plant at Nord-Deutsche Affinerie in Hamburg, and later a commercial plant for the recovery of 30 tons of SO_2 per day was built and operated at Lille in France. Guggenheim Brothers, New York, developed a new process using dimethyl-aniline as absorbent. Falconbridge Nikkelverk in Kristiansand, south Norway, is using this process for recovery of SO_2 from gases containing only 2.5% SO_2 at their nickel refinery. The two last-mentioned absorption processes employ organic solvents with high capacity for SO_2 absorption, which makes the equipment more compact and cuts down the steam and power consumption.

A gas containing 8 to 10% SO_2 may economically be directly compressed and cooled for production of liquid SO_2. This procedure requires simple equipment as absorption and stripping are left out. The power consumption is relatively high, depending upon the gas volume to be compressed and this method is therefore advantageous, particularly when the power price is reasonable. The direct compression method has been operated on a commercial scale by Etablissement Kuhlmann in France.

In industrialized areas there is now a market for SO_2 as a refrigerant and, in the chemical industry, liquid SO_2 is also much in demand in the cellulose industry, where the pure SO_2 has definite advantages as compared with SO_2 from burning elemental sulphur or pyrites. In localities where there is no market for sulphuric acid or SO_2, elemental sulphur may be produced direct from a gas containing about 10% SO_2 as practiced at Boliden in Sweden. Alternatively, pure SO_2 may be recovered from the gases by absorption or other methods, and concentrated SO_2 reduced with coke to sulphur.

The new methods of recovering SO_2 or sulphur in connection with electric smelting certainly open up interesting possibilities for metallurgical plants. It is no longer necessary to go into the desert to put up a smelter or, alternatively, run the risk of law suits for damage to the surroundings, stimulating the well-known "smoke farming."

Instead of designing another "world's tallest chimney" in connection with a copper or nickel smelting plant, these modern tools of electric smelting and recovery of the concentrated SO_2 gases offer a combination of processes which may be of great value in the future, provided electric power is cheap in the locality concerned, and secondly that the liquid SO_2 or elementary sulphur can be disposed of with a profit.

Cost Comparison Attractive

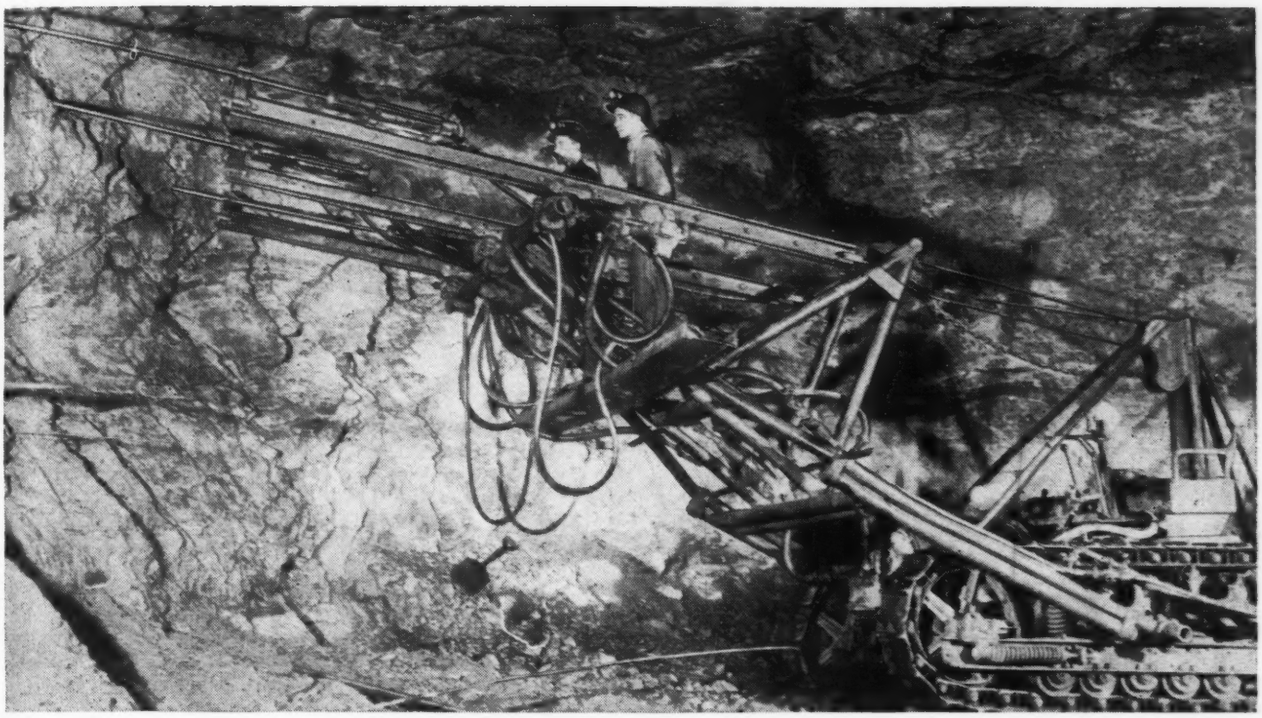
Operating costs of electric matte smelting are low when electric power is available at a reasonable price. For pre-roasted hot material, a power consumption of 320 kw.-hr. per ton has been estimated.

According to a recent textbook[4], the coal consumption in modern reverberatory furnaces by smelting hot calcines is 0.12 ton coal per ton of charge, which in heat value corresponds to about 830 kw. hr. The comparison illustrates the superior thermal efficiency of electric smelting. The economy of electric matte smelting will depend primarily on the relative price of electricity and coal (oil or gas).

If, for instance, the coal price is $10 per ton, the cost of power will equal the cost of coal at a power price of 3.8 mills per kw. hr.

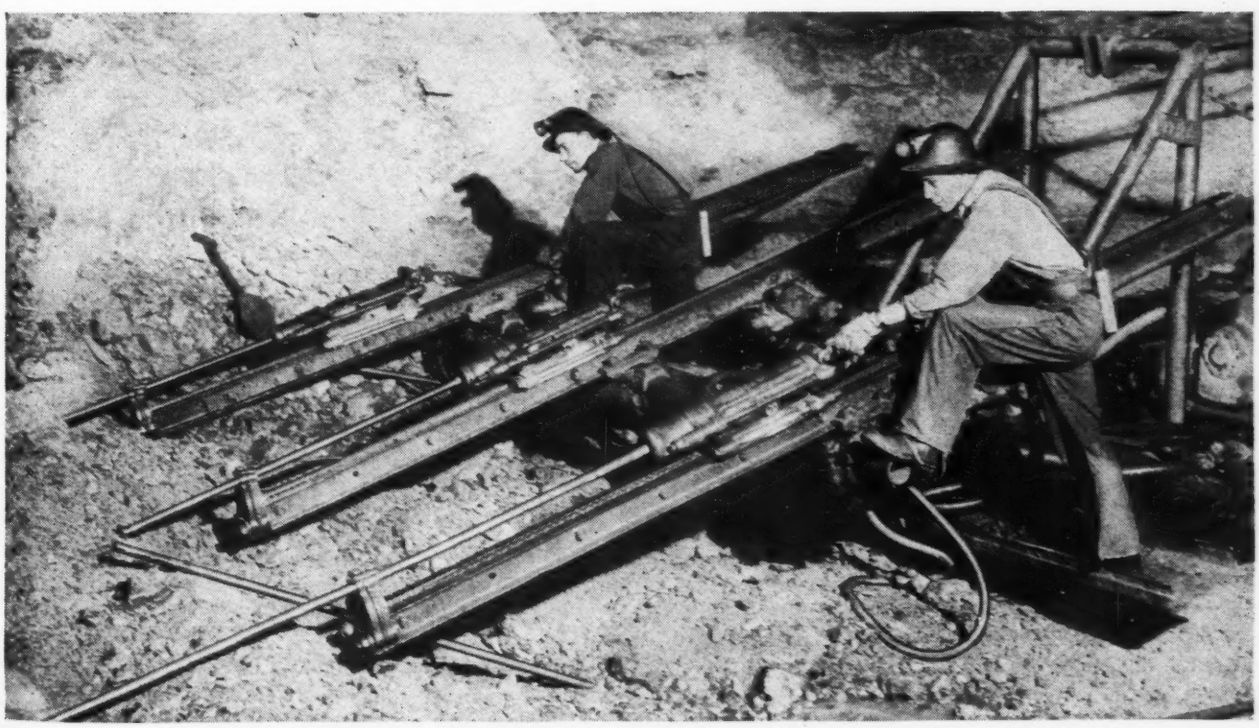
Mechanized charging of the furnace and automatic control of the electrodes make furnace operation simple and reliable and contribute to lower costs of production. Maintenance and repair costs are negligible.

[4] "Metallurgy of Copper." By J. Newton and C. L. Wilson. 111 (1942).

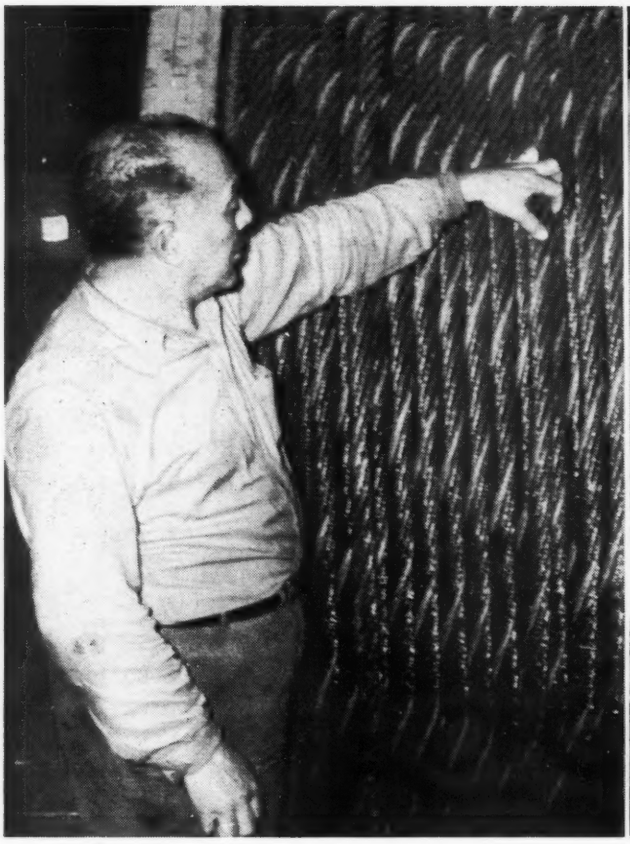


IN ADDITION to the crawler-mounted, diesel-powered C-4 Eimco shovel shown on the cover, Eagle-Picher employs this three-drill, crawler-mounted jumbo in its Tri-State operations. Drifters are mounted on wagon-drill sashes, and moved by chains, sprockets and air motors. One ten-foot steel is used. Holes are completely drilled with one bit. Two men operate three machines.

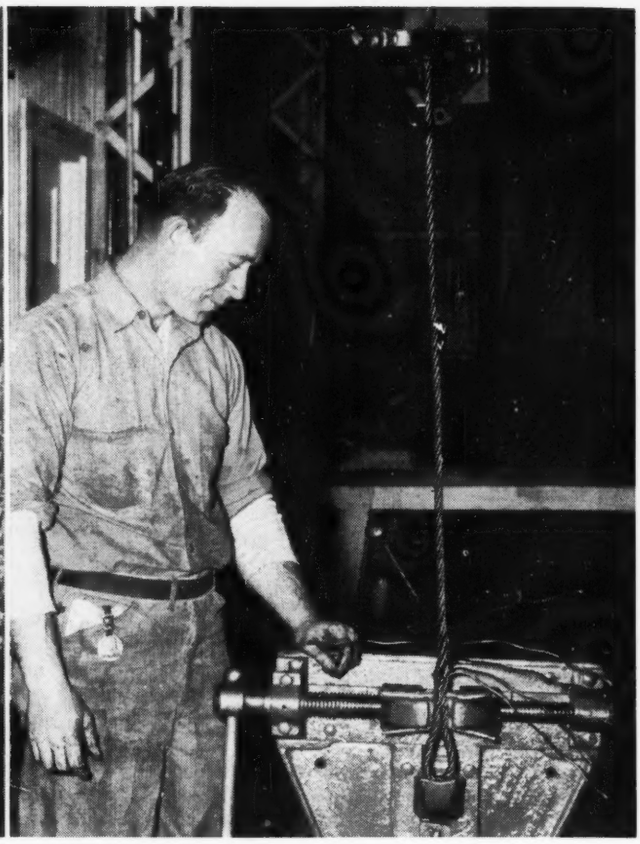
Shovels and Drill Jumbos Mounted On Crawlers at Eagle-Picher



A CENTERING DEVICE on the front of each sash helps the drillers collar the holes.



MR. DOMICO EXPLAINS that new hoist ropes must be re-reeled and checked for tight strands before being installed.



RETIRED HOIST ROPES are spliced in rope house to be used for many other purposes in the mines.

Inspection—Key to Longer

ALBERT DOMICO, Wire Rope Foreman, Copper Queen Mines, Phelps Dodge Corporation.

PROPER LUBRICATION and regular inspection are the keys to longer life for hoist ropes, and guarantee a greater second life for retired hoist ropes used in the mine. This is proved by rope records of Copper Queen mines, Bisbee, Arizona, which has eight operating shafts, and six major hoists. Hoist ropes are 1 to 1½ in., improved plow steel, 6x21, lang lay, hemp center. Three of the ropes are preformed, and others will be replaced by preformed ropes as soon as they wear out.

Every foot of hoist rope is inspected once each month, and the following observations are recorded: (1) Amount of diameter wear, which also reveals crown-wire wear; (2) increase in length of lay; and (3) broken surface wires if any. A monthly lubrication check is also made, following four regular weekly lubrication checks.

All hoist ropes are lubricated by automatic drip and some weekly manual brushing. We use only factory-recommended lubricants, and through laboratory research, have developed a schedule for applying a grease-type lubricant which is giving us maximum safe life.

Preformed Ropes Now Used

For example, the record for a set of 3,450-ft., 1½ in., improved plow-steel hemp-centered, preformed hoist ropes which were put on in November, 1942, shows the following information: Fifty-one reported inspections were made. The ropes were lubricated 204 times, and 204 inspections for lubrication were made. As of February 1947, the ropes handled 1,200,000 tons. Six samples of the rope were cut at different periods, and sent to the manufacturer for strength test. Ropes are retired when remaining strength falls below 85% of original strength at time of installation. All tests showed strengths far above the 85% limit.

We believe that this longer-than-average safe life is due to regular, proper lubrication, and the use of preformed ropes. In two tests, in which preformed ropes were compared with other types, the preformed ropes handled greater total tonnages and required less repair and service.

New hoist ropes are re-reeled and socketed in the rope house. They are inspected foot by foot during re-reeling, and examined particularly for tight strands.

A shop-built air motor rotates the reel which is mounted on a shaft on horses. See illustration. A pin on the shaft engages the reel. The air-motor drive consists of a gear bored to fit the end of the shaft driven by a pinion attached to a

standard air motor. The air motor is attached to one horse.

When a rope is installed in the shaft, we neutralize the rope's torsional tension with a lever-operated, ball-bearing swivel built in our shop. See illustration. This swivel is connected between the cage kingbolt and rope socket. The lever acts as an adjustable friction control, relieving the rope's torsional tension by controlling the number of turns let out. As the rope travels down the shaft, it has a tendency to let out turns. This tension is relieved at each level as the rope is lowered.

On a recent installation of 3,000 ft. of $1\frac{3}{8}$-in., lang lay, preformed rope, 284 turns were let out of each rope. No trouble with slack or knotting was encountered. These ropes have hoisted 750,000 tons, and appear to be good for an additional 750,000 tons.

Life of hoist ropes is also increased by changing the lay on the drum end. This automatically changes the lay on the first, second, and third wraps, and prevents continuous and excessive wear to sections of rope at such critical spots as cross-over points.

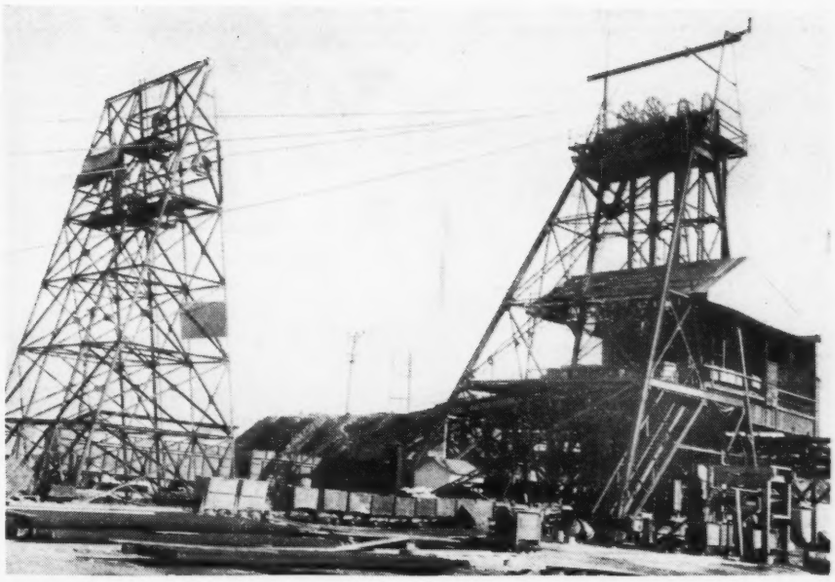
Although hoist ropes are never spliced, we do splice ropes for general mine use. Contrary to common belief, the preformed ropes are easier to splice than non-preformed ropes because it is easier to open the lay. In making the tuck, the strands of the preformed rope are straightened, and the splice is completed as with other types of rope.

In one test, we found that a splicer could make a factory splice on a 6x19, $\frac{1}{2}$-in., non-preformed rope in six hours, as compared with four hours for a preformed rope of the same type.

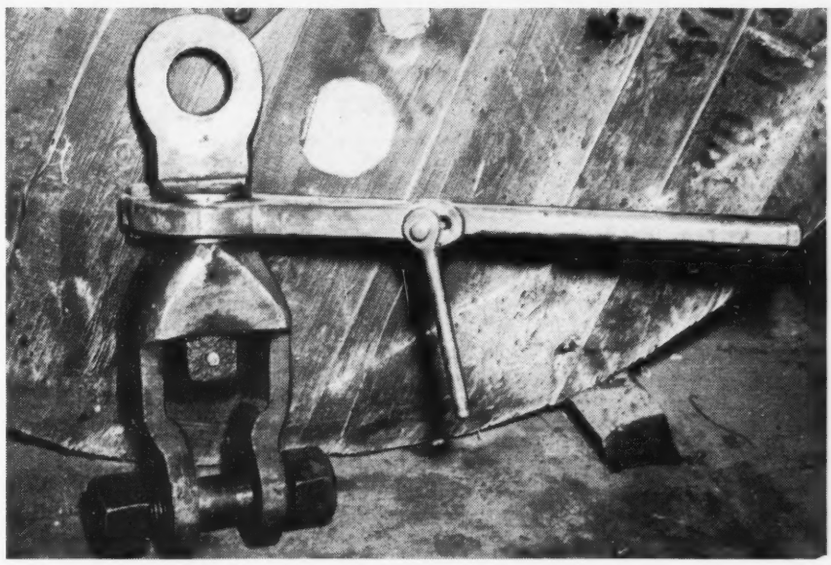
With very little additional repair and service a second and third safe life can be obtained from retired hoist ropes. However, the ropes must be properly selected, lubricated, and serviced at the start to permit re-use of hoist ropes for other purposes.

Our over-all rope cost has been cut 30% by proper maintenance. This does not take into consideration the longer initial life which ropes have because of adequate lubrication and care.

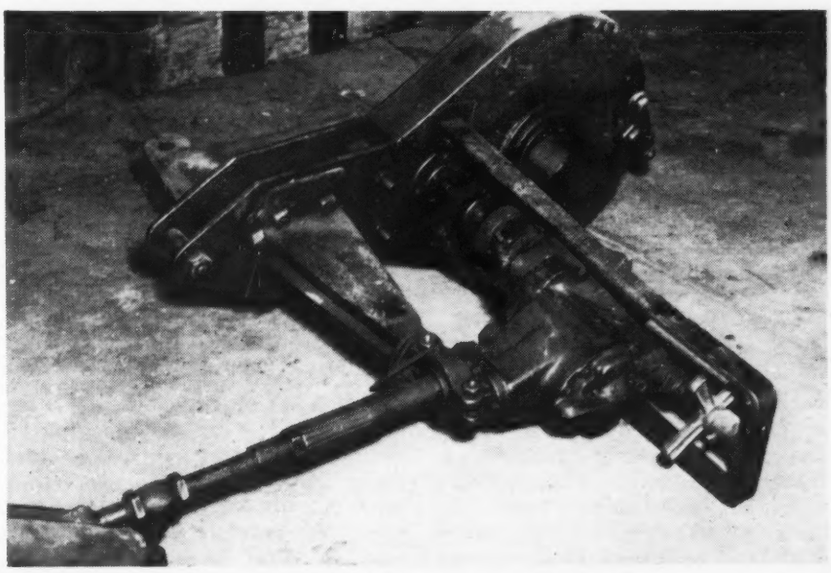
Rope Life



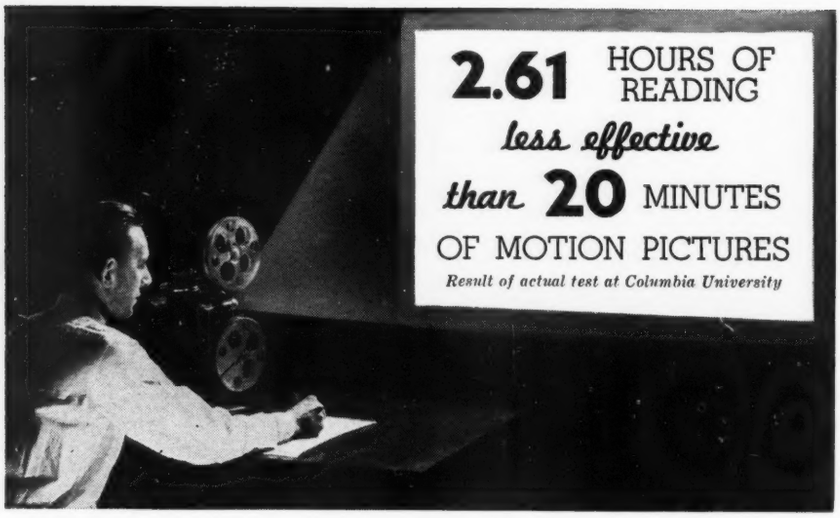
HOIST ROPES at the Copper Queen handle 15,000 tons of ore a month.



BALL-BEARING SWIVEL relieves rope's "twist" during installation.



AIR-DRIVEN MOTOR is used to wind hoist ropes on wooden reels.



Greater Use of Films Urged As Teaching Aid

GEORGE B. CLARK, Assistant Professor of Mining Engineering, University of Illinois, Urbana, Ill.

VISUAL AIDS have long been used in all kinds of schools—elementary and secondary, vocational, professional, extension and night schools. Slides, models, charts, film strips and motion pictures have been employed for more than a decade by a large number of progressive schools.

In the highly specialized training programs of our armed forces during the last war, visual training aids came convincingly and permanently into their rightful place in educational and training techniques. Where rapid and complete training meant not only the difference between life and death to the soldier but to our nation as well, visual aids were vital factors which helped lead to victory for the Allies on the battle fields of the world.

Army doctrine declares that "No lesson is complete without training aids; they add interest and vitalize learning. . . ." Aids of every description are employed by the Army and Navy, not only to accelerate training programs, but to give them life and reality and make them completely effective. Many of the problems encountered in college engineering education, of course, are different from those involved in military training, but the principles of teaching and learning are the same.

To claim that application of the successful results of our armed forces with audio-visual aids will revolutionize our methods of teaching would be unreasonable. It would be an even greater fallacy to state that military methods of teaching will shorten the education period of the engineering student. It would, however, be proper to emphasize that such aids could be used to great advantage to teach more engineering fundamentals in the same time.

An Aid for Mining Schools

This is especially true in the field of mining engineering. Much of mining engineering is application of engineering facts, a good portion of which have been arrived at on an empirical basis and the teaching of which is largely descriptive. Charts, maps and models probably found their way into the classroom of the very first course in mining engineering ever taught. But these standard aids must now give precedence to one of the most recent developments, the motion picture. Use of motion pictures in the classroom is not a new idea, but the proposal that they be used on an extensive scale to teach engineering and allied subjects is a promising innovation.

Such schools as Purdue University, New York University, Pennsylvania State College and others have done much toward production and use of educational films on a college level. The U. S. Office of Education, the U. S. Bureau of Mines and many industrial organizations have produced large numbers of films, both silent and sound, which are available from instructional aid bureaus all over the United States.

Some pertinent facts, however, should be brought to light concerning the use of motion pictures in engineering, and particularly in mining engineering education.

Advantages derived from the use of films have been outlined as follows[1]:

(1) Pictures are able to standardize impressions and make them clear and complete, uniform, lasting and specific.

(2) Motion pictures overcome time and space. By means of them, rapid processes can be slowed down and slow processes speeded up.

(3) Motion pictures bring actual facts and life into the classroom.

To these might be added:

(1) They show to students operations and procedures performed by experts.

(2) They avoid "verbalism", which is the use of words and word pictures in such a manner that they allow erroneous interpretation.

(3) They increase student interest by vitalizing and enriching the instruction, thus promoting interest and further study.

(4) They effect economy of time and learning, permitting acquisition of more knowledge.

(5) They show the relation be-

1. Ellis, D. C. and Thornborough, L. "Motion Pictures in Education." Crowell, 1923.

tween the abstract idea and the concrete object.

A number of objections to the use of films[1] have been advanced:

(1) Films cause eyestrain.

(2) Films are a fire hazard, and present many mechanical difficulties in projection and high cost of production.

(3) Films make learning too easy, reduce reading and destroy the sense of language perfection. They dull the imagination and substitute entertainment and passive acceptance for active effort in learning.

(4) Proper films not available.

(5) Films are too rapid.

(6) Notes needed by the student are seldom taken due to the darkness of the room.

A recent statement[2] in "Vanguard" gives a clear idea of the results that may be expected:

"1. Films can speed up training. Some Army estimates run as high as 40%; some industrial leaders say as high as 75%. Depending on the subject and period over which the films are judged, it should run from 15 to 50%.

"2. Facts learned from films are retained or remembered longer. Research in this area indicates that the retention of facts learned from films is 55% better than when learned in other ways.

"3. Film use may make the total training better and more effective. Sometimes the increased effectiveness of films is used not to shorten the period of time required for training but rather to provide better training.

"4. The use of films secures better attention and holds the interest of the class. A number of observations on this point attest the fact that classes trained by films have had less absenteeism and greater promptness in attendance."

A Comparison

Actual tests conducted at Columbia University showed that 2.61 hours of reading is less effective than twenty minutes of pictures.

The reader can readily evaluate the foregoing factors in terms of his own experience and needs.

Professor Jones,[3] of the University of Texas, made the statement: "Technical writing is a subject which lends itself naturally to the use of visual aids. . . .

". . . . the sound film is an unexplored medium of instruction in English composition. Several possibilities offer themselves: a full period on the mechanics and organization of the long report; a short film on the handling of bibliography and footnotes; another on effective outlines and abstracts; still another on varying levels of technical language.

"Second, the resources of the film strip need to be extended to the English instruction."

This would do much to counter the criticism that industry and former graduates are leveling at our college graduates in engineering: that they do not have the ability to write effective engineering reports. Montana School of Mines is among those schools which have taken the lead in requiring classes in technical report writing: yet to make a place in the curriculum for these non-technical courses, the number of hours in technical classes had to be correspondingly reduced.

Complementary Aids

From our military experience, it was learned that films are not *supplementary* but *complementary* aids to teaching. They are an integral part of the teaching program, and as such provide an opportunity to break away from the daily routine of lectures, problems and quizzes.

Engineering films have been classified into three categories by M. C. Giannini,[4] as follows:

(1) Survey Film. That type which attempts to present a general survey of a particular field, i.e., to demonstrate some broad principle or process without any attempt to delve into any theoretical or technical aspects. They are to be welcomed as very useful to the student and the instructor. This type of film is fairly plentiful.

(2) Technique Film. That type which instructs in a specific technique. It has the obvious advantage of being seen by all of the students in large classes where demonstration with an actual object is usually limited. Use of film strips to augment this type of motion pictures is recommended. These are also fairly plentiful in some fields, but not in mining.

(3) Teaching Film. This type is relatively rare. Such a film is designed to teach a new concept or principle in engineering and requires considerable research, development and labor to produce.

Motion pictures of this type are of most value in teaching mining.

Teaching Films Wanted

Most mining engineering educators will probably agree that a number of detailed technical films on mining methods, showing by photograph, diagram and animated drawing, methods of drilling, blasting, development and extraction of ore, would be of invaluable assistance in giving the student a concrete conception of the processes involved. There already exist a number of good films on various phases of mining, but most of them would fall in the survey group.

Such films as "Nickel Mining", made by the U. S. Bureau of Mines in cooperation with International Nickel Co., are instructive in that they help the student to visualize accurately many of the processes involved in mining. "Copper Mining in Arizona", prepared in cooperation with the Phelps Dodge Corporation, is one of similar value. Both these films and practically all others available, are of general informative character, instead of dealing with a particular process or operation. Such a film has excellent application when shown at the end of a series of courses in mining covering the above subjects, but has little application in teaching details of any one operation.

Production of film strips taken as still shots from the above films would enhance their value for classroom use. These strips allow a "flash back" to an operation which can then be elaborated upon.

Another important application of films that emerged from wartime experience is found in the observed ability of motion pictures to develop and mold attitudes. Most of the thoughtful movie-going public is aware of the effect of screen plays and screen editorials on our thinking—how it vitalized the process of converting a peaceful America into the most effective war machine in the world. This and the other fertile fields are open for development and application in mineral industries education, if the proper films can be made available.

2. Vanguard. "Visuals Make Teaching More Dynamic." 1.1 April 1947. Hubert D. Hall Foundation. Mr. Hall has kindly supplied the photograph reproduced on the opposite page.

3. Jones, J. "Visual Aids in Technical Writing at the University of Texas." Jl. of Eng. Ed. 35:292-4, Dec. 1944.

4. Giannini, M. C. "Types of Films in Engineering Education." Jl. of Eng. Ed. 37:491-5. Jan. 1947.

Coniaurum Makes Own Bit For Less Than 14 Cents

SUBSTITUTION of the four-point detachable bit, shown in the drawing, for the conventional sharpened steel used up to four years ago by Coniaurum Mines Ltd., at Schumacher, Ont., has resulted in saving the 2½ hours hoisting time formerly lost in handling steel, according to John Redington, general manager, who developed the bit. For rods, ⅞-in. quarter-octagon alloy steel, containing approximately 0.40% carbon, is employed.

Four bit usages are obtained, the bit being sharpened three times, with a drop in gage each time of 1/16 in., so that a new 1⅝-in. starter winds up with a diameter of 1⅜-in. Hot milling is employed. Bits, when discarded, are returned to the steel manufacturer. Bit costs and related data are given in the accompanying tables.

According to Mr. Redington, detachable bits are used for about 35 percent of the drilling done in the Porcupine camp (in which Schumacher is situated). Likewise, ⅞-in. quarter-octagon alloy steel is employed for 70 percent of the holes. All mines except one use hot milling. The bit and the rod on which it is used are shown in the several drawings reproduced below. The mode of attachment may be seen.

Data on Detachable Bits Used by Coniaurum Mines Limited, Schumacher, Ont.

JANUARY SEPTEMBER 1946

Bits Used	Total Cost	Cost per Bit
146,871	$20,257.70	$0.1379

DETAILS OF COSTS PER BIT

		Total Cost	Cost per Bit
Labor		$8,346.47	$0.0568
Supplies			
Bits	$7,204.49		
Shank Steel	2,053.80		
Sundry	925.03	10,183.32	0.0693
Comp. Insurance		238.77	0.0016
Electric Power		936.30	0.0064
Steam Heat		315.69	0.0022
Compressed Air		237.15	0.0016
		20,257.70	0.1379

Analysis of Foregoing Costs

Bits	Cost	Cost per Bit
1. Labor	$5,332.11	$0.0363
2. Shop Overhead	360.00	0.0025
3. Tabulation	348.00	0.0024
4. Supplies	7,204.49	0.0490
5. Comp. Insurance	174.20	0.0012
6. Electric Power	936.30	0.0064
7. Steam Heat	157.83	0.0010
	$14,512.93	0.0988

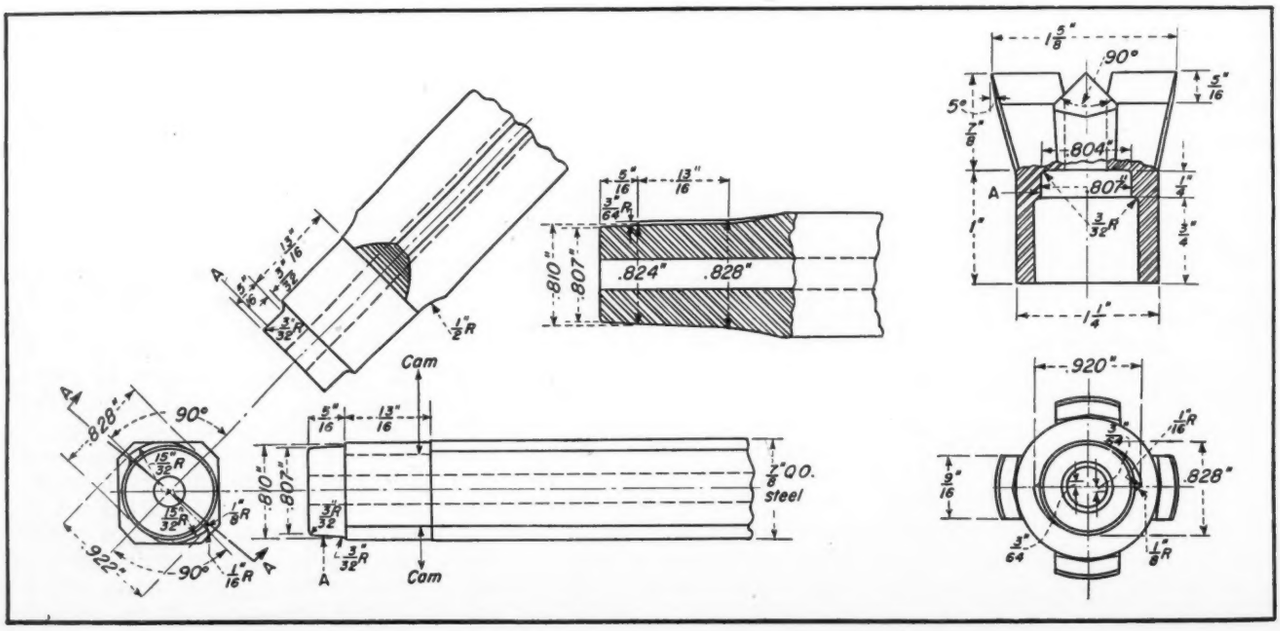
Shank Steel	Cost	Cost per Pound
8. Labor	$1,546.15	$0.1248
9. Shop Overhead	720.00	0.0581
10. Supplies	2,160.18	0.1744
11. Comp. Insurance	64.57	0.0052
12. Steam Heat	157.86	0.0128
13. Compressed Air	237.15	0.0192
	$4,885.91	0.3945

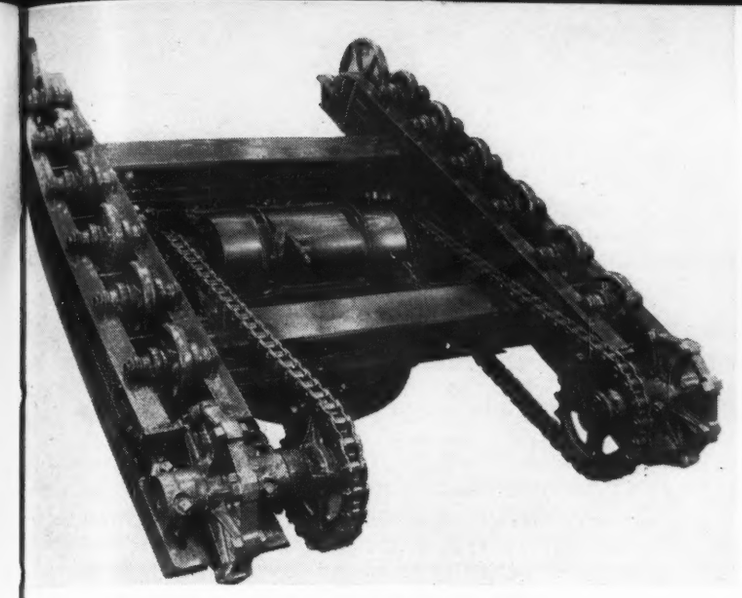
Items 1, 2, 3, 8 and 9 for labor expended on bits and shank steel, including shop overhead, total $8,306.26. The difference between this and the item of $8,346.47 for total labor cost given above is $40.21, expended for relining the furnace.

Item 10, showing $2,160.18 for supplies, includes the $2,053.80 for shank steel, shown above, plus $106.38 for tools made from discarded steel.

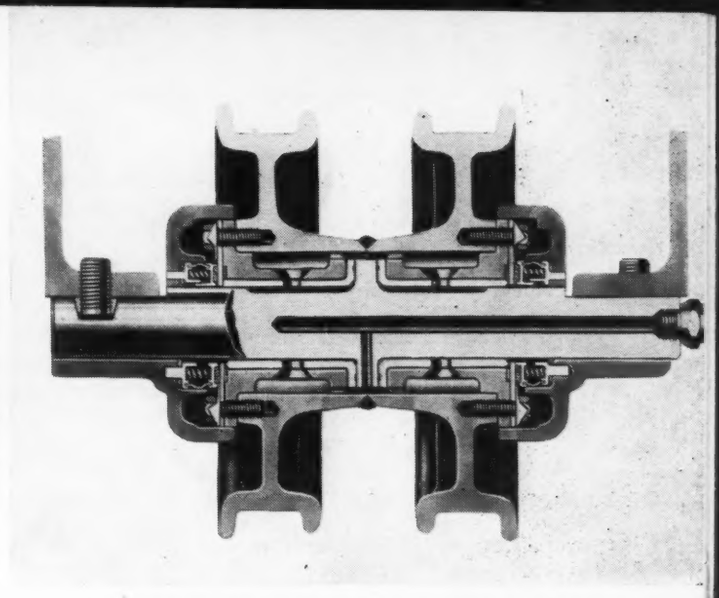
Cost of Bits Per Ton Broken and Other Data

Total tonnage broken, ore and waste	93,022
Cost per ton (20,257.70 ÷ 93,022)	$0.2178
Machine shifts	4,735
Tons per machine shift (93,022 ÷ 4,735)	19.65
Miner's shifts	34,608
Tons per miner's shift (93,022 ÷ 34,608)	2.69
Number of bits used	146,871
Tons per bit (93,022 ÷ 146,871)	0.63
Bits used per machine shift	31.02
Bits used per miner's shift	4.24
Bits broken, 1424. Percent of total	0.97
Bits missing, 7045. Percent of total	4.80





SECTIONAL VIEW of a Caterpillar track roller



A BUCYRUS-ERIE crawler track assembly with tracks off.

Crawler Track Lubrication

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THE FOCAL POINT of a machine equipped with a crawler track is the track roller mechanism. If it fails, the machine stops or else wears the track roller pins so severely as to require replacement. Track roller lubrication is therefore probably the most important single feature in the maintenance of crawler track machines.

Track rollers are separated from the ground only by the track itself and must work in mud, sand, water, ice and snow while carrying the entire load of the crawler track machine. This combination of load and wet, abrasive operating conditions has presented a lubrication problem which has only recently been solved by the development of specially prepared track roll lubricants.

The crawler mechanism consists of a sprocket-driven endless chain formed by short sections of metal plates or track shoes hinged together. On the back of each track shoe two short parallel rails combine to form a track which runs on small wheels called variously: track wheels, truck wheels, track rollers, crawler rollers, and bogie wheels. These are carried on plain sleeve-type bearings or roller bearings.

The plain bearing track roller is an exceptionally well designed mechanism. Its method of lubrication is simple, befitting its rugged construction. The lubricant is applied under air pressure from a 6 to 1 or a 10 to 1 ratio air pump or through a hand-operated volume compressor. The lubricant is forced through a button-head grease fitting located at the end of the roller. This fitting is a spring-loaded valve which opens wide for volume flow of lubricant when pressure is applied. From the drilled shaft the lubricant is forced into a reservoir or cavity in the track roller bearing. From the reservoir, the lubricant flows through short passages to plain bronze bearings. Leather, composition or metal-faced seals at each end of the shaft prevent lubricant leakage and keep out dirt.

Seepage Blocks Dirt

Even though ingenious and effective types of seals are used, some foreign matter tends to work into the bearings, especially if operating in fine sand and water, when rollers are worn, or if seals are hardened or damaged. To counteract this tendency of dirt and water to work into the bearings it is desirable to allow a seepage of lubricant.

The problem has been to provide a water-resistant lubricant which would be sufficiently fluid to flow through the lubricating passages, keeping seals in good condition and counteracting the entrance of dirt and water, but not too fluid to leak excessively and allow the rollers to run dry.

Oil is satisfactory for new rollers, but is apt to leak excessively from worn rollers, especially on a hot day. Grease, on the other hand, may not flow sufficiently on a cool day to keep out dirt and water. Ordinary grease also is difficult to handle in the pumping equipment which is used for applying lubricant. Buttery, semi-fluid chassis lubricants are a poor compromise. They tend to leak too much from worn rollers on warm days and are not sufficiently fluid on new rollers in cold weather.

The essential characteristics of the lubricant are fluidity, water repellence, pumpability and economy. It must flow properly where clearances are small yet not leak excessively from worn rollers. It must prevent the entrance of water which can cause rust. It must be easily pumped by the volume compressor. Regardless of price it must hold the wear and replacement of parts to an economical minimum.

A modern track roll lubricant should be available in seasonal grades—light, medium and heavy. The medium grade should be suited for normal atmospheric temperatures: 32-90 deg.; the heavy grade for temperatures above 90 deg.; and the light grade for temperatures below 32 deg.

Track roll lubricants are recom-

mended for all track rollers fitted with plain bearings. If a track roll lubricant is of such a nature that it can be used in all types of track rollers (except those running on roller bearings), the lubrication of machines is expedited on large projects where a variety of equipment is in service. A good track roll lubricant can be used in all plain track rollers, and is also well suited for all parts of the crawler mechanism requiring lubrication, including the front idler bearings and the outer sprocket shaft bearings. Such a lubricant is also widely used as a general purpose lubricant in cold weather for all plain bearings not subjected to external heat. No lubricant should ever be applied to the track shoe pins. The original stiffness in new tracks will soon disappear in service.

Manufacturers recommend that plain bearing track rollers be lubricated at intervals ranging from 2 to 120 operating hours, depending on the type of lubricant, design of roller, condition of seals, nature of terrain and atmospheric temperature. When operating in water, the interval should be four hours or less. Shovels, draglines and cranes should be lubricated every two hours when traveling. However, most contractors prefer to lubricate each roller with the grease gun at least once each shift, since the men responsible for lubrication cannot always know the extent to which each roller is worn, the condition of the seals, or what type of ground condition has been, or will be encountered. This can be done rather quickly when the machine is being fueled and other daily maintenance items checked.

Keep Fittings Clean

To lubricate plain bearing track rollers the button-head or other type of grease fitting should be thoroughly cleaned with a stiff brush. Better still, one of the special pocket tools which are available for cleaning dirt from the groove of the button-head fitting may be used so that the hose coupling can be quickly and easily attached. The tool also removes dirt from over the center inlet hole, preventing this dirt from being forced into the bearing. The oil hose connection from the bucket or other type pump should be hooked on to the track roller fitting. Lubricant should be pumped into each bearing until clean lubricant begins to show.

In applying lubricant, the first strokes of the gun will refill the reservoir while the following strokes push out the lubricant adjacent to the seals which has become contaminated with dirt or water. After the reservoir has been refilled, increased pressure will be required at the gun handle. If the ground conditions have not been bad, one extra stroke of the gun after the reservoir has been refilled should suffice. If the machines have been operating in mud and water or very fine sand, several extra strokes may be required before clean grease is visible at the roller shaft end or at the roller end collar. Too much pressure should not be applied to the lubricator handle, or seals may be injured.

Care of Roller Bearings

Roller bearings are used in truck wheels, idlers, and track rollers of Allis-Chalmers track-type tractors. These assemblies are provided with positive seals on either end for retention of lubricant in the bearing and exclusion of water and foreign matter.

Until recently, engine oil of the viscosity used in the tractor engine was recommended for lubricating the roller bearing type of truck wheels. To increase the length of time between service periods, however, these assemblies are now packed with grease at the factory. Assemblies that have been packed with grease should not be lubricated with oil later.

Rollers that are being operated in the field with oil can be converted to grease lubrication without removal from the tractor, providing they are in good mechanical condition. Operators who prefer oil may continue to use it with assemblies that originally contained oil. If oil is used, a lubrication interval of 200 hours is recommended.

Grease-packed assemblies should be relubricated at 1,000-hour intervals. The type of grease recommended for these bearings was selected because of its good heat and oxidation stability, good pumpability and cold temperature characteristics, and for minimum effect on the synthetic rubber boots of the lubricant seals.

Greases most completely meeting the requirements are calcium or lime soap base products, although some barium, aluminum or lithium soap greases might also be found satisfactory. A worked penetration range (ASTM) of 255 to 385 at 77 deg. F. is recommended, with the viscosity of the mineral oil component specified as 120 to 185 S.U. seconds at 130 deg. F.

Before packing with grease in the field, the operator should make certain that roller assemblies are in good condition and that there is no excessive oil leakage. The assembly should be inspected for end play and looseness. To inspect the truck wheels it is necessary to take the weight of the tractor off them and check each truck wheel, support roller and idler separately. If end play or up-and-down motion is present the assembly should be removed and repaired before serious damage or complete failure occurs. Packing an assembly with grease will not correct worn or broken parts.

While the track roller is a simple rugged mechanism, it is probably more subject to wear than any other lubricated part on construction machinery and, therefore, must be given a certain amount of care. Most cases of undue wear are due to failure to apply the right lubricant at the right time.

Danger Signals

The following signs of difficulty should be watched for:

1. Rapid wear of one flange or roller, usually due to misalignment of idler or sprocket with rollers. Realign.
2. Roller runs hot, usually due to misalignment or lack of lubricant, it may have been overlooked at last lubrication period.
3. Excessive amount of lubricant required. If roller is not running hot, this is usually due to defective seals. Replace.
4. Roller does not revolve in service, usually due to insufficient end or shaft clearance. Check.
5. Roller flanges cutting into crawler frames, usually due to worn thrust washers. Replace.
6. Track tends to climb sprocket, indicating the track is too loose. Adjust tension.
7. Oil leaking at sprocket shaft nut. This usually indicates loose sprocket. Tighten sprocket bearing adjusting nut.

To understand the theory of lubrication and to appreciate those factors which determine the relative lubricating value of any lubricant is commendable; to be able to put this knowledge into practice signifies that the machine requirements are quite as fully understood.

MARKETS—Trends and Prices

Threat of Labor Trouble Results in More Cautious Sales Policy — Silver Price Down

UNEXPECTED DEMANDS for a general upward revision of wage contracts by the Mine, Mill and Smelter Workers' Union upset an otherwise more or less normal summer market for major non-ferrous metals. The copper industry was more concerned over the labor situation than operators in lead and zinc. Pending developments, offerings were on a reduced scale. As July ended, however, there were indications that a serious work stoppage in the industry could be averted. In the first half of July, vacations at brass mills and other fabricating plants reduced consumption of copper and other metals. Wire mills continued to operate at a high rate. The price situation was unsettled in spots, particularly in the foreign field. The E.&M.J. index of prices declined from 150.05 in June to 148.73 in July. Weakness in silver was a factor.

The Premium Price Plan, in which marginal and high-cost mines were deeply interested, was approved by Congress late in the month. The President is expected to sign the measure. With only $35,000,000 a year available over the next two years with which to carry out the program, mining men believe that the task of administering the plan will be a difficult matter. Tri-State zinc producers were described as being "elated" over the passage of the subsidy program. Marketwise, the plan is not expected to influence the general situation. With the supply outlook pointing to a fairly balanced condition and more orderly buying, now that the so-called pipelines are filled, consumers are limiting their purchases to cover nearby requirements. Interest in forward business was light throughout the month.

Domestic copper held at 21.225c. f.o.b. refinery with but one exception throughout the month. On the first trading day a consumer in need of July copper paid a slight premium to get the metal. With some plants down for a period because of vacations, shipments of refined copper to consumers during July may not reach 100,000 tons, which compares with actual deliveries in June of 116,876 tons. During the first half of 1947, shipments of refined copper averaged 122,128 tons. Most observers believe that domestic consumers will absorb copper in the July-Dec. period at a reduced rate, compared with the first six months of the year.

Consumption of copper in the United States during the first half of 1947, based on statistics compiled for the fabricating division of the industry, was estimated at 706,889 tons. Deliveries to fabricators in the same period totaled 732,771 tons. The fabricating section placed consumption for June at 103,944 tons, against 113,157 tons in May. The peak month in consumption of copper this year was 139,263 tons in January.

Foreign purchases of copper during July were on a reduced scale. The shortage of dollar exchange no doubt was an important factor in limiting sales abroad. Prices were unsettled, with sales abroad at a range of 20⅜c. to 21½c., f.a.s. New York equivalent.

Production of copper in North and South America, and Rhodesia, during May and June, according to the American Bureau of Metal Statistics, in short tons, was as follows:

	May	June
United States (crude)	91,203	81,864
Canada (refined)	18,732	18,708
Chile (bar)	41,752	.....
Peru (crude)	1,951	1,850
Mexico (crude)	5,800	5,377
Rhodesia (crude)	19,610	17,685

The last week in July found operations at Braden Copper, in Chile, down because of a strike. Rhodesian producers have been handicapped because of temporary coal shortages. However, in spite of various interruptions in production that have occurred so far this year, world output is expected to be appreciably higher in 1947 than in the preceding year.

A Chester Beatty, chairman of Selection Trust, at a recent meeting in London, declared that a more balanced statistical position in copper accounted for the recession in the foreign price this year. The rise in prices earlier in 1947 was aggravated, in his opinion, by the bulk-buying policy of the British Government. A spokesman for the Ministry of Supply said the Government had hoped that normal trading conditions would have returned to the metal markets of the United Kingdom before now, but there was no point in opening the London Metal Exchange if dealings were not possible owing to shortage of supplies or currency restrictions. Oliver Lyttleton, who made open charges of inefficiency regarding the operations of the British program, declared that all the skill and ingenuity in the world could not make the bulk-buying of non-ferrous metals a success. The Government buyer, he said, could be seen a mile off and every time he made a bid—as the biggest buyer in the world—the price was raised.

United States Copper Statistics

The following summary of copper statistics for the United States is based on reports by members of Copper Institute. Statistics through March 1947 cover duty-free copper; thereafter copper from all sources. Beginning with April this year, the total of stocks at beginning of period plus production minus deliveries does not equal stocks at end of period, owing to inclusion of foreign copper. Figures are in tons.

	Production				
	Crude Primary	Crude Secondary	Refined	Deliveries	Stocks, Refined
1941	985,288	31,708	1,065,667	(a) 1,545,848	75,564
1942	1,098,007	54,337	1,135,708	1,635,236	65,309
1943	1,111,022	83,677	1,206,871	1,643,677	52,121
1944	995,938	60,242	1,098,788	1,636,295	66,780
1945	792,126	49,541	843,113	1,517,842	76,512
1946	618,757	32,503	604,071	(b) 1,261,830	80,832
1947:					
January..	71,255	7,001	80,144	143,692	76,680
February	69,012	5,462	77,591	117,734	74,645
March .	75,378	8,978	87,141	120,820	71,507
April ..	75,772	13,155	104,430	(c) 115,601	85,293
May ...	77,108	14,095	108,464	118,048	83,980
June ..	73,320	8,534	98,738	(d) 116,876	76,629

(a) Includes exports of 307 tons; (b) 909 tons; (c) 222 tons; (d) 224 tons.
Note: Figures for March, April, and May have been revised.

MARKETS—Trends and Prices

Lead presented an orderly picture in that consumers continued to take all of the metal that was offered to them. About the only change in the situation was some uneasiness over the price trend later this year. A dip in consumption, which some observers believe is due, should make for an easier supply outlook. So far, however, quotations were maintained on the basis of 15c. per pound, New York. Production declined in June and July, but consumers continued to get liberal tonnages at the expense of a reduction in stocks. The June statistics of the domestic industry showed that shipments of refined lead to consumers totaled 54,627 tons, against 50,483 tons in May. Production in June was 45,235 tons, against the monthly high this year of 53,822 tons in May. Stocks in the hands of producers declined from 47,233 tons at the end of May to 37,836 tons at the end of June.

Zinc buying was on the quiet side throughout the period under review. The supply remains ample, with all grades available for early shipment. Formerly, both Prime Western and Special High Grade were comparatively tight, with galvanizers and die-casters taking all of the metal that they could get hold of. Production of slab zinc in June totaled 70,990 tons, according to the American Zinc Institute. Combined domestic and export shipments in June amounted to 63,527 tons, against 70,803 tons in the preceding month. Stocks of slab zinc in producers' hands on June 30 totaled 174,327 tons, an increase of 7,463 tons, compared with a month previous. Prime Western zinc, East St. Louis, continued at 10½c. Foreign zinc was available at 10c., Gulf ports.

Tin production in the Far East is gradually improving, though not at a rate to really ease the supply situation. Allocation and import controls on tin and tin products were extended until March 1, 1948.

Silver remained unsettled and declined to 61⅜c. At the lower level the Mexican Government again entered the market for 2,000,000 oz. for coinage purposes, thereby stabilizing quotations. Finance Minister Betata declared that Mexico is coining more silver because the authorities have always backed a bi-metal monetary policy. Purchases of silver, he said, presented an opportunity to carry out the program at a time when silver producers are passing through a serious crisis.

Major Metals

U. S. DAILY AND AVERAGE PRICES

1947 July	Electrolytic Copper: Domestic Refinery (a)	Electrolytic Copper: Export Refinery (b)	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
1	21.250	21.425	80.000	15.000	14.800	10.500
2	21.225	21.425	80.000	15.000	14.800	10.500
3	21.225	21.425	80.000	15.000	14.800	10.500
4	Holiday	21.425	Holiday			
5	No Market	21.425	80.000	15.000	14.800	10.500
7	21.225	21.425	80.000	15.000	14.800	10.500
8	21.225	21.425	80.000	15.000	14.800	10.500
9	21.225	21.425	80.000	15.000	14.800	10.500
10	21.225	21.400	80.000	15.000	14.800	10.500
11	21.225	21.100	80.000	15.000	14.800	10.500
12	No Market	21.175	80.000	15.000	14.800	10.500
14	21.225	21.425	80.000	15.000	14.800	10.500
15	21.225	21.250	80.000	15.000	14.800	10.500
16	21.225	21.050	80.000	15.000	14.800	10.500
17	21.225	21.250	80.000	15.000	14.800	10.500
18	21.225	21.425	80.000	15.000	14.800	10.500
19	No Market	21.425	80.000	15.000	14.800	10.500
21	21.225	21.425	80.000	15.000	14.800	10.500
22	21.225	21.425	80.000	15.000	14.800	10.500
23	21.225	21.425	80.000	15.000	14.800	10.500
24	21.225	21.425	80.000	15.000	14.800	10.500
25	21.225	21.425	80.000	15.000	14.800	10.500
26	No Market	21.425	80.000	15.000	14.800	10.500
28	21.225	21.425	80.000	15.000	14.800	10.500
29	21.225	21.425	80.000	15.000	14.800	10.500
30	21.225	21.100	80.000	15.000	14.800	10.500
31	21.225	21.300	80.000	15.000	14.800	10.500
AVERAGES FOR MONTH						
July	21.226	21.359	80.000	15.000	14.800	10.500
AVERAGES FOR WEEK						
July						
2	21.230	21.425	80.000	15.000	14.800	10.500
9	21.225	21.425	80.000	15.000	14.800	10.500
16	21.225	21.233	80.000	15.000	14.800	10.500
23	21.225	21.396	80.000	15.000	14.800	10.500
30	21.225	21.371	80.000	15.000	14.800	10.500
CALENDAR WEEK AVERAGES						
July						
5	21.231	21.425	80.000	15.000	14.800	10.500
12	21.225	21.325	80.000	15.000	14.800	10.500
19	21.225	21.304	80.000	15.000	14.800	10.500
26	21.225	21.425	80.000	15.000	14.800	10.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1947 July	Sterling Exchange "Checks"	Silver: (c) New York	Silver: London	Gold: London	Gold: (d) United States
1	402.500	63.750	38.50d.	172s. 3d.	$35.00
2	402.500	64.750	39.00d.	172s. 3d.	35.00
3	402.500	64.750	39.50d.	172s. 3d.	35.00
4	Holiday	Holiday	39.75d.	172s. 3d.	Holiday
5	(e)	(e)	(e)	(e)	35.00
7	402.500	64.750	39.50d.	172s. 3d.	35.00
8	402.500	64.750	39.50d.	172s. 3d.	35.00
9	402.500	64.750	39.50d.	172s. 3d.	35.00
10	402.500	64.750	39.50d.	172s. 3d.	35.00
11	402.500	64.750	39.50d.	172s. 3d.	35.00
12	(e)	(e)	(e)	(e)	35.00
14	402.500	64.750	39.75d.	172s. 3d.	35.00
15	402.500	64.750	39.75d.	172s. 3d.	35.00
16	402.500	64.750	39.50d.	172s. 3d.	35.00
17	402.500	64.750	39.50d.	172s. 3d.	35.00
18	402.500	64.750	39.50d.	172s. 3d.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	402.500	63.750	39.50d.	172s. 3d.	35.00
22	402.500	61.750	39.00d.	172s. 3d.	35.00
23	402.500	61.750	37.50d.	172s. 3d.	35.00
24	402.500	61.750	37.75d.	172s. 3d.	35.00
25	402.500	61.750	37.75d.	172s. 3d.	35.00
26	(e)	(e)	(e)	(e)	35.00
28	402.500	61.750	37.75d.	172s. 3d.	35.00
29	402.500	61.750	37.75d.	172s. 3d.	35.00
30	402.500	61.750	37.00d.	172s. 3d.	35.00
31	402.500	61.750	37.00d.	172s. 3d.	35.00
AVERAGES FOR MONTH					
July	402.500	63.568	38.837	—	35.00
AVERAGES FOR WEEK					
July					
2	402.500	62.750	—	—	—
9	402.500	64.750	—	—	—
16	402.500	64.750	—	—	—
23	402.500	63.350	—	—	—
30	402.500	61.750	—	—	—

Calendar week averages, New York Silver: July 5th, 64.000; 12th, 64.750; 19th, 64.750; 26th, 62.150.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.275c. per pound, the average differential for freight and delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade in most instances is 1¼c.

Quotations for lead are for common lead.

(c) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions, and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS—Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for June and July:

	June	July
Quicksilver, N. Y. flask	84.000	84.000
Antimony (a)	35.940	35.940
Antimony, bulk, Laredo	33.000	33.000
Antimony, in cases, Laredo	33.500	33.500
Antimony, Chinese (b)	.....	.....
Platinum, oz. troy	55.640	53.000
Cadmium (c)	175.000	175.000
Cadmium (d)	177.500	177.500
Cadmium (e)	180.000	180.000
Aluminum ingot	15.000	15.000
Magnesium	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

100 is composite for 1922-3-4. (Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1937	90.86	1942	86.80
1938	73.67	1943	88.74
1939	77.71	1944	88.74
1940	79.22	1945	90.86
1941	83.49	1946	110.057

	1945	1946	1947
January	88.74	96.42	140.88
February	88.74	96.42	140.42
March	88.74	96.42	150.71
April	88.74	96.42	153.14
May	88.74	96.42	154.03
June	88.74	107.16	150.05
July	88.74	117.11	148.73
August	88.74	113.32	.....
September	91.16	113.32	.....
October	96.40	114.25	.....
November	96.42	131.23	.....
December	96.42	142.19	.....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major non-ferrous metals. Prevailing delivered prices for consumers in the United Kingdom follow:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	132	0	0
Fire refined, high conductivity	132	0	0
Fire refined, high grade	131	10	0
Fire refined, min. 99.2 percent	131	0	0
Fire refined, min. 99.7 %	130	10	0
Hot rolled black wire rods	138	0	0
LEAD:			
Soft, foreign, duty paid	90	0	0
Soft, Empire	90	0	0
English refined	91	10	0
ZINC:			
Foreign (G.o.b.), duty paid	70	0	0
Domestic (G.o.b.)	70	0	0
Prime Western and debased	79	0	0
Refined and electrolytic	70	15	0
Minimum 99.99 percent	72	5	0
TIN:			
Ingot, 99 percent	437	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(July 31, 1947)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	35.940
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$1.75
Calcium, lb. ton lots, 98 percent, cast	$1.85
Chromium, 97 percent grade, lb.	89c.
Cobalt, 97 to 99 percent, per lb.	$1.65
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 percent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$53.00
Quicksilver, flask of 76 lb., 25 flasks or more	$84.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$20.00
Titanium, 96 to 98 percent, lb.	$8.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$14.00@$16.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal)	$37.00@$38.00
48% Cr_2O_3, 3 to 1 ratio	$39.00@$40.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$5.95
Mesabi bessemer	$5.70
Old Range non-bessemer	$5.80
Mesabi, non-bessemer	$5.55
Lead (Galena) 80 percent, Joplin, Mo., ton	$195.65
Manganese Ore—Per long ton unit of Mn, basis 48 percent manganese, subject to premiums and penalties, f.o.b. cars Atlantic and Gulf ports, duty paid, 64@66c.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid	$32
Domestic, scheelite, 60 percent and upward	$32
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	6c.
Cobalt Oxide, 70 to 71 percent, lb.	$1.27½
Copper Sulphate, 100 lb.	$7.60

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent, per lb. of Cr contained	15.60c.
Ferromanganese, 78 to 82 percent, gross ton	$135.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	7.45c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 percent C, per lb., contracts	6.45c.

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$750@$800
Crude No. 2	$302@$4.10
Spinning fibers	$170@$2.30
Paper stock	$43@$65
Shorts	$20@$38
Vermont, f.o.b. Hyde Park:	
Shingle stock	$82.50@$91.50
Paper stock	$58.00@$65.00
Waste	$43.00
Refuse or shorts	$20.50@$38.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.50@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.00@$5.00
Domestic, chemical, 55 to 58 percent	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Maryland, ball, bulk	$7.00@$9.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 70 percent, all rail movement, ton	$33.00
Acid 98 and 1 percent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica: Domestic producers quote on punch and sheet as follows: Punch, 22c. per pound; 1½x2 inch, $1.10; 2x2 inch, $1.60; 2x3 inch, $2.10; 3x3 inch, $2.75; 3x4 inch, $3.50; 3x5 inch, $4; 4x6 inch, $5. Wet ground, very fine, $90 per ton. Special grades command premium. Bulk sales dry ground, $32.50 per ton. Scrap, $28 per ton and up.	
Ocher, Georgia, ton	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00@$18.00
Talc, f.o.b. works, ton:	
New York, air-floated, 325 mesh	$17.00@$20.00
Vermont, extra white, 200 mesh	$14.00@$16.00
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$36.00
Steel, base price, Pittsburgh Billets, gross ton	$42.00
Structural shapes, 100 lb.	$2.65

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Boyd Appointment Held Up on Objection by Lewis

Because of the objections of one man, the nomination of Col. James Boyd, former dean of the faculty of the Colorado School of Mines, as new director of the Bureau of Mines was pigeon-holed as the Senate drew near the end of the session. The objector, who stopped Senate action on the Boyd appointment, was John L. Lewis, head of the UMW. Lewis made the objection last spring during the height of the fight over validity of the Krug-Lewis agreement. His reason was that Boyd is not well enough versed as to safety in coal mining. The nomination was sent back to the President for interim appointment.

Lack of confirmation of the Boyd appointment leaves the Interior Department hierarchy in something of a predicament. Secretary Krug wants Boyd for the job, but the latter at press time had not made a decision whether he would accept such an appointment.

The only other possible nominee who would be acceptable to Lewis is said to be George Lamb, former assistant director of the Bureau and now an official of the Pittsburgh Consolidation Coal Co. Lamb negotiated the Krug-Lewis agreement.

The resignation of Dr. R. R. Sayers, who had served as Director of the Bureau since 1940, was accepted by the President July 13. Dr. Sayers returned to the U. S. Public Health Service. Subsequently it became known that the Public Health Service has given him leave of absence to accept the chairmanship of the Medical Board established by the trustees of the UMWA Welfare and Retirement Fund to serve the bituminous coal industry. Thomas B. Miller, assistant director of the Bureau, is acting director, pending a new or interim appointment.

Budget Compromise Helps Survey and Mines Bureau

In the adjournment rush, the House and the Senate split their differences on appropriations for the Department of Interior for the next fiscal year, giving the Bureau of Mines an operating budget of $12,035,800 and the Geological Survey one of $10,091,000. The compromise allayed the fears of these two bureaus as to greatly reduced operations next year. At first it was thought that the Bureau of Mines would have to cease operations in some of its field stations and pilot plants. The Senate restored the House cuts in these items with the specification that all stations and plants continue in operation. As a result, most of the old projects and a limited number of new ones will be continued, even though the final grant was more than $4,000,000 short of original estimates.

The Geological Survey's budget for next year, still only slightly more than half of the amount originally estimated, will enable that agency to continue all present projects. Some decentralization will be necessary, however, because of Washington personnel limitations.

Transfer of funds from the military and other highly important governmental agencies to the two bureaus will help them continue such services as mapping, charting, foreign mineral surveys, and exploration for strategic materials for those agencies.

Treasury Appeals for Aid To End Gold Speculation

On indications that the premium market for gold is expanding, Treasury and Federal Reserve officials on July 18, appealed to individuals, banks, and business enterprises to aid in stopping "speculation" in the metal in foreign markets. The appeal "requested Americans to refrain from encouraging and facilitating this traffic, and, in particular, to refrain from extending the use of their facilities and funds from carrying out such transactions."

Advices from Manila received here earlier declared that Philippine officials plan to do nothing to halt the private sale of gold to British, Chinese, and other purchasers at prices higher than $35 an ounce. This development, it is believed, caused the Treasury and the Federal Reserve Bank to take notice of the free market.

Previously, John W. Snyder, Secretary of the Treasury, at a news conference, said an offer by an American concern to buy gold contained in Canadian concentrates for sale abroad in the free market had not been discussed.

Data on the size of the private market in gold is not available, it was pointed out, but an official declared the volume so far has not been extensive. Monetary experts now contend that the premium-price sales exert a disruptive effect on exchange rates of the various international currencies.

In giving Canada's position on the sale of gold contained in certain concentrates, Finance Minister Abbott remarked that the Canadian Government has permitted mines in British Columbia, whose concentrates required special treatment not available in Canada, to ship the material to plants in the United States. All other gold produced in Canada must be sold to the Mint on the basis of $35 an ounce. Gold produced in the United States must be sold to the Treasury at the fixed price. Permission is granted to allow gold obtained from foreign concentrates for refining to be re-exported for sale in the free market.

Effort Succeeds To Extend Percentage Depletion

In a last-minute effort to jam through the Congressional mill a measure (H. R. 3624) providing for re-enactment of percentage depletion for approximately 24 minerals and metal mines, Rep. B. W. Gearhart (R., Calif.) tacked it on to an omnibus tax bill (H. R. 4069) introduced by Rep. Harold Knutson. The effort was successful and the measure went to the President where it awaits his signature.

The tax bill has been amended in late July to include the Gearhart measure as a section, providing percentage depletion for the following minerals: coal, fluorspar, flake graphite, vermiculite, beryl, feldspar, mica, talc (pyrophyllite), lepidolite, spodumene, barite, ball, sagger and china clay, rock asphalt, bentonite, thenardite, gilsonite, trona, phosphate rock and bauxite potash, sulphur, and trona; also metal mines. The bill repeals section 124(e) of the Revenue Act of 1943, relating to termination of percentage depletion of certain minerals.

Depletion allowances as prescribed under the bill would be 5% for coal mines; 15% for metal mines and nonmetallic minerals; and 23% for sulphur mines.

Holders of U. S. Claims Must Do $100 Work

A reminder has been issued by the Interior Department that the minimum of $100 worth of assessment work must be done on unpatented mining claims in the United States before noon, July 1, 1948, to retain possession of them. Although this legal requirement has been suspended for the current fiscal year with respect to claims in Alaska, it remains effective as to claims that are situated in the United States. Failure to perform assessment work on a claim may result in efforts by a competitor to relocate it.

Congress Passes Measure Reviving Subsidy Payments

Congress completed legislation that extends the Premium Price Plan for two years. Final action in the Senate did not take place until early on Sunday, July 27, with manganese, along with copper, lead, and zinc, eligible for subsidy payments. President Truman is expected to sign the measure.

The bill extending subsidy payments on metals was introduced by Rep. Allen, of Illinois, early in July soon after the wartime Premium Price Plan lapsed because of a disagreement in the House over matters relating to its administration. Before the House acted favorably on the measure on July 22, manganese was included in the list of metals to receive assistance under the plan.

Legislation provides that subsidy payments are not to exceed $35,000,000 a year for a period of two years, retroactive to June 30, 1947. The Reconstruction Finance Corporation is instructed to pay producers. Congress appropriated $300,000 to the Department of Commerce to be used in administering the program.

It was argued for a time that payments under the plan could not be made without a specific appropriation. However, Senator Millikin, of Colorado, who sponsored the Senate version of the bill, said RFC officials assured him that a separate appropriation would not be needed. The senator asked quick passage of the bill to avoid closing down a large number of marginal and high-cost mines.

Premium payments, under the new law, provide for some adjustments to encourage exploration and development work. Premium payments for any particular metal contained in the ore "shall be in addition to the amount received per unit by the producer, but no payment shall be made to a producer when the market price plus such payment would exceed the limits of the plan in effect June 30, 1947." RFC payments are not to exceed 16.5¢ per pound for zinc, 14.75¢ for lead, and 27¢ for copper.

To carry out the provisions relating to manganese, it was estimated that not more than $1,500,000 will be needed during the first year, and $3,000,000 in the second year.

The tightness of the market for copper, lead, and zinc has precluded any purchases of these metals for the stockpile, according to Senator Millikin, who was authorized to make this statement by the Strategic Metals Committee, Army and Navy Munitions Board.

John D. Goodloe, head of RFC, in a letter to Senator Barkley, warned that the $35,000,000 ceiling on annual payments will be insufficient, as about $60,000,000 was spent on the program in the last fiscal year. Senators who mentioned the reduced size of the appropriation were told that it will be the Department of Commerce's job to operate within the limit of $35,000,000 a year.

The bill was a "political football", kicked from one side of the fence to the other during the entire session. It started out as a conservation measure, to be continued for five years and to cover some forty-odd strategic minerals. The appropriation was to be $100,000,000 a year, later dropped to $70,000,000. The original bills on the subject, some six of them, were consolidated into one introduced in the House by Rep. Charles H. Russell of Nevada.

The Russell Bill was approved by Committee and given a rule, but even with a rule was shelved by the Republican majority leaders in the House. A compromise measure, introduced by Rep. Leo Allen, Illinois, which would continue the plan for two years, as is, with a $70,000,000 appropriation authorization, was accepted by the Republicans.

It was Rep. Francis Case of South Dakota who inserted an amendment bringing manganese into the subsidy.

In the Senate, with only a few days of the session left to go, the bill was sanctioned by committees and reported to the floor. Several amendments loomed on the horizon but were "talked" down by Western Senators. Finally in the early hours of the last day of the session it was brought to the floor and passed after another amendment, which had nothing to do with the bill, was put forth and defeated. This would have amended the Contract Termination Act.

In discussion of the bill on the Senate floor, it was disclosed that the Reconstruction Finance Corp., which pays the plan's bills, had a serious doubt that the $35,000,000 a year authorization would be sufficient. That doubt continues.

The placing of manganese under the subsidy will cost approximately $1,500,000 the first year and about $3,000,000 the second year, according to Senator Millikin. Administration of the plan will continue as it has under the Office of Premium Price Plan.

W.A.A. Offers Surplus T N T for Continuous Sale

Approximately 25,000,000 lb. of surplus trinitrotoluene (TNT) is being made available for continuous sale at a new low price of 4½¢ per pound, the War Assets Administration has announced. This explosive, relatively insensitive to shock and one of the most stable of the high explosives, does not deteriorate and can be stored over long periods. E. & M. J. editors know of no instance where it has been used in mining work. In any case, it can not be employed underground because of the noxious fumes it produces.

Science Foundation Set Up by Act of Congress

Congress has created the National Science Foundation to organize and direct a coordinated U. S. program of fundamental research. The law was passed in the closing days of the session after a year and a half of hearings and discussion, in the course of which volumes of testimony, pro and con, were taken from Government officials, industrialists, and scientists. The law puts the scientists in full charge.

The only deterrent to passage as the session neared its end was the fact that both the Senate and the House had passed bills which differed slightly in context. The result was a last-minute compromise.

The important differences included the method of selecting the members of the Foundation and its Director, elimination in the House measure of "pork barrel" amendments which would pass out 25% of Foundation funds to the States, and an unchanged versus a limited patent control over work that would be financed by the Foundation.

As the law now reads, it provides for: 1. Presidential appointment and Senate approval of a 24-man board of directors to serve six-year terms. 2. Appointment of the Foundation's director for an indeterminate term by the members of the Foundation themselves. 3. An executive committee of nine, elected by the Foundation from its own membership, with authority to exercise the powers granted the Foundation. The committee must meet at least six times a year, while the Foundation is required to meet only once a year.

Patent policy under the Foundation law is only slightly different from present Government patent policy. Provision for a 25% split with the States was stricken from the final bill.

Obstacle Under New Law for Trade Mark Owners

Under the new trade mark law, according to Patent Commissioner Casper W. Ooms, the owner of a certification mark (one used to identify a chemical or metallurgical process, for instance) is subject to cancellation proceedings if the owner himself engages in the production or marketing of any goods or services to which the mark is applied.

As an example, the Commissioner foresees the possibility of the inventor of a process being prevented from licensing others to use a certification mark along with the process as long as he is using the process and mark.

Patent experts, however, note that there may be other methods of reaching the same result.

NEWS OF THE INDUSTRY

Smelter Offers to Sell Gold on Free Market

Wide publicity was given early in July to a report that originated in Canada to the effect that the American Smelting & Refining Co. is treating gold-bearing concentrates shipped into the United States from mines in British Columbia and settling for the gold content at a higher price than that fixed by the United States Treasury, or $35 an ounce troy of fine gold less one-quarter of one percent.

The following letter was sent by the A.S.&R. Co. to Canadian shippers of gold in concentrates:

"Although no firm foreign market exists for gold-bearing materials of foreign origin, in the sense of a market having the backing of any government, we are able, by close attention to world conditions, from time to time to sell such gold for delivery in the foreign market at a net realized price higher than the net U. S. mint price for imported gold.

"Beginning as of June 1st, 1947, and until further notice, we will endeavor to sell each month for delivery in the foreign market the payable gold content of your production, together with that of other shippers received at our plants in the third preceding month, at a price in excess of the net price being paid by the U. S. mints for imported gold.

"To the extent that we are able to so market your gold, additional payments will be made to you, based on the difference between the gold price realized by us from the sale of gold for delivery in the foreign market, during the third month following the month of arrival of your product at our plant less a charge of 10% of said difference, with a minimum charge of 50c per ounce."

For further comment on the importance of this development, see Washington Reflections, page 102.

San Manuel Drilling Nears Completion

The development of San Manuel Copper Corporation's orebody by drilling is almost completed, according to a recent report to stockholders of Magma Copper Co. Underground work must now be undertaken and the board of directors has authorized the company to enter into a loan agreement with the Bankers Trust Co. and the Mutual Life Insurance Co. to provide for funds in a minimum amount of $1,750,000 and a maximum amount of $3,500,000, repayable over the period between Dec. 31, 1950, and June 30, 1957. Developed tonnage of the orebody on March 31 was estimated at 354,500,000 tons, of which 235,000,000 tons assaying 0.80% copper is sulphide.

Independent Sales Policy For Spanish Quicksilver

Based on the fact that it possesses the richest quicksilver deposit in the world, Almaden, operating in Spain, will face the marketing of its output in the future in an independent position, according to the Madrid correspondent of the Mining Journal, London. The Council operating the enterprise will regulate output, prices, and sales as conditions dictate. Henceforth, annual production will not be stunted by alien influences. Production is expected to exceed the earlier annual quotas.

Expanding production, together with a more effective treatment of ore and improved operation of the distillation plants, should provide an available stock of quicksilver from the Government-owned mines sufficient to face any market eventuality, the management believes.

"To attend to the whole trading movement, an agency is to be constituted abroad," the publication points out, "but it has not been settled whether this representation will be single or multiple, or where it will be located." The agency will operate under the direct control of the Almaden Council.

Ore reserves of Almaden are estimated at about 5,000,000 tons, which assures to the property a life of 200 years, even presuming an annual output of 82,000 flasks of quicksilver, the report from Madrid states.

German Observer Tells of Soviet Uranium Mining

Behind their "iron curtain" in Germany, the Soviets have been exploiting the uranium deposits of the Erz Gebirge area in southern Saxony near the Czechoslovakian border. A German observer, who risked a general look around, gives this thumbnail sketch of the veiled operations:

The workings, which are small and marked by crude wooden headframes, are scattered in and around the towns of Oberschlema, Schneeberg, Neustadel, Zachorlau and Johanngeorgenstadt. The area is Germany's chief source of cobalt, and Oberschlema is the home of the Staatliche Kobalt Worke. Other minerals mined include antimony and bismuth.

The wooden shafts are sunk to a depth of about 30 to 50 ft. From the base of the shaft, workers tunnel in one or more directions.

Workers load the uranium ore, which has the appearance of a rich, heavy loam, into dump cars which are hoisted to the top of the shaft and slid by overhead cable to a truck loading point. In some pits, the uranium ore is loaded directly into wooden boxes, in others it is boxed at the loading point.

Most of the output is transported to proving centers in the area. One of these is a disused factory building near the railroad station in Oberschlema, where only Russian women are employed. Each is equipped with an instrument to test the presence or strength of the uranium content. Acceptable boxes are sealed and loaded into closed freight wagons. The only destination known to German train crews is a stop five stations away, where locomotives and crews are changed. Reports that there is an initial separation process elsewhere in Germany before final shipment to Russia, are unconfirmed.

In the Erz Gebirge area, some 18,000 German workers are reported to be engaged in uranium mining. Most of them have been drafted by labor offices in nearby cities and villages. They are billeted in homes in the area. As they cannot have their families with them because of inadequate accommodations, they are paid a separation allowance. Wages are considerably above the prevailing rates in other occupations, and extra food rations are given. The Soviets, however, have made the extra food rations contingent on fulfilling a work quota.

German workers are closely supervised by Russian guards. All technical matters are handled by Russians. For example, while tests are made to determine the quality of ore and the direction of veins, the German workers are kept out of the pits. Every effort is made to veil the technology involved.

The Soviets are operating the pits three eight-hour shifts, seven days a week. Operations began in September, 1946.

Nation's Railroads Seek Still Higher Rates

Railroad companies of the nation have recently filed a petition with the Interstate Commerce Commission requesting freight rate increases as follows: Within the eastern territory, 25%; southern territory, 15%; western territory, 15%; interterritorially between southern and western terri-

tories on the one hand and the eastern territory on the other hand, 25%; and between southern and western territories, 15%.

Specific increases on a carlot basis are included in the new proposal as follows: Iron ore, 15c. per ton on all rates; limestone, a maximum of 20c. per ton; manufactured iron and steel products, semi-finished steel, pig iron, iron and steel scrap, a maximum of 7c. per 100 lb., but not in excess of $1.40 per ton net or gross, as rated; all bituminous coal, 15c. per ton except tidewater export which would be increased 25c. Switching charges would be increased 25% in Official Territory. (Official Territory, roughly speaking, includes the area above the Ohio River extending from Chicago and St. Louis on the west, to the New England coast.) Handling charges on iron ore at lower lake ports would be increased 10%.

In addition to increases already granted railroads this year, these increases, if granted, would constitute a total rise in rates of approximately 33% in one year.

White Pine Development Planned by Copper Range

The Copper Range Co. has completed its exploratory program at the White Pine property in Ontonagon County, Mich., and after August 1 will confine its work there to shipping ore from the stockpile to the Freda mill for metallurgical tests.

Copper minerals occur finely distributed in sandstone and shale. Good progress has been made in the problem of extraction, and when the labor situation, materials market, and copper price become more stable, the Copper Range Co. plans development of the property.

Cleveland Cliffs Co. Merges With Cliffs Corporation

A new Cleveland-Cliffs Iron Co. with assets of $95,000,000 was formed on July 9 by a merger of the old Cleveland-Cliffs Iron Co. and The Cliffs Corporation, according to an announcement by Edward B. Greene, chairman of the board of the new company.

The new company succeeds to some $34,000,000 of steel stocks formerly held by the two companies, and to net current and fixed assets of the old Cleveland-Cliffs Iron organization, which included the second largest iron ore reserves in the Lake Superior district as well as mines, a railroad, public utility plants, timber holdings, docks, and a fleet of vessels.

As a result of the merger, which was approved by a large majority of stockholders of both companies, the new company is now in a strong position to develop the large iron ore reserves, Mr. Greene said.

Compensable Diseases Listed in State Laws

The Legal Committee of the Industrial Hygiene Foundation, Pittsburgh, Pa., has issued an analysis of five state occupational disease compensation laws enacted at the 1947 sessions of the legislatures. The accompanying table compiled from material in the report shows metals (in some instances their compounds) and minerals which may cause occupational diseases or poisoning, and lists those states which list these materials in their recently enacted schedules for compensable diseases.

House Bill No. 373, State of Montana, creates a commission known as "The State Commission for the Study of Occupational Diseases," according to the Hygiene Foundation report. This commission is to be comprised of two representatives from organized labor, two from industries, and the fifth, a licensed physician and surgeon resident of Montana. The bill directs the commission to make a survey of occupational disease with particular reference to silicosis, to determine the existence of such disease in Montana, and measures whereby undesirable existing conditions may be remedied. Provision is made for public hearings with the direction to the commission to submit to the next legislative Assembly a report of its findings and conclusions not later than ten days after the convening of the 1949 session of the Assembly.

Substances Listed in Schedules for Compensable Diseases

	Ia.	Nev.	S. D.	Tenn.	Tex.
Aluminum Trioxide	—	—	—	—	L*
Antimony	—	—	L	—	—
(Asbestosis)	—	—	—	L	—
Arsenic	—	L	L	—	L
Beryllium	—	—	—	—	L
Brass	—	L	—	—	—
(Chrome ulceration)	L	L	L	—	L
Cadmium	—	—	L	—	L
Lead	L	L	L	L	L
Manganese	L	L	L	L	L
Mercury	L	L	L	—	L
Phosphorus	—	L	L	—	L
Selenium	—	—	L	—	L
(Silicosis)**	L	L	L	L	L
Tellurium	—	—	L	—	L
Thallium	—	—	—	—	L
Vanadium	—	—	L	—	—
Zinc	L	L	—	—	L

*L indicates that the materials are listed in the schedules for compensable diseases. **Special provisions are made for silicosis, limiting monetary liability, and excluding partial disability in some instances. Parentheses indicate diseases.

New Tin Smelter Planned By Vulcan Detinning Co.

At hearings held in Washington recently in connection with the extension of tin control, H. H. Buckman, representing the Vulcan Detinning Co., asked that an amendment be inserted in the measure under consideration to provide for the removal of import control on tin ores and concentrates.

Mr. Buckman declared that Vulcan Detinning has plans under consideration for the construction of a tin smelter that would use a new process to treat low grade concentrates available from Bolivian and Mexican sources.

Construction of the plant is awaiting final action on easing the import restrictions. Details on the size of the project have not been disclosed, but unofficial reports indicate that the company plans to spend $1,500,000 for construction of a smelter having a capacity to produce around 3,000 tons of tin a year. The process, it is claimed, makes it possible to produce Straits quality tin from ore averaging no more than 17% tin.

The Government's tin smelter at Texas City produced 14,644 tons of tin in the first five months of 1947.

St. Lawrence Waterway Opposed by Iron Company

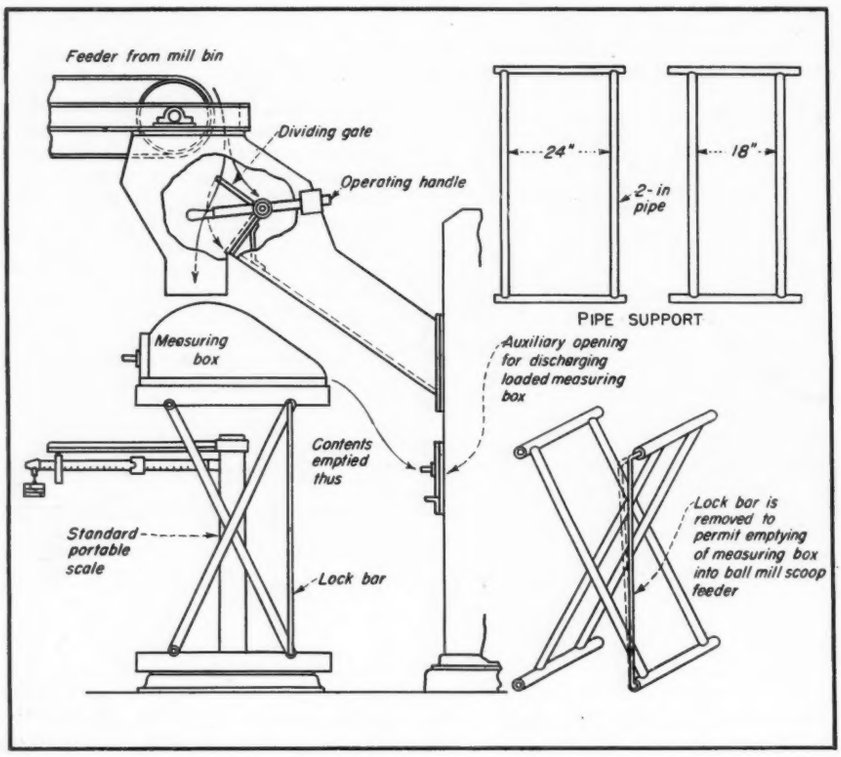
The St. Lawrence Waterway Project was opposed by Alexander C. Brown, president of the Cleveland-Cliffs Iron Co., in a recent statement to the Senate Foreign Relations Committee. Mr. Brown said that the proposed waterway constitutes a threat to the normal expansion and development of the Lake Superior iron ore industry.

This industry, he said, is confident in its ability to produce large tonnages of high-grade ore for an almost unlimited time by concentrating low-grade taconite and jasper. But, he added, the iron ore industry must be permitted to continue unhampered "in a normal evolutionary pattern the progress already made on the technological and economic problems involved in this undertaking. All major producing companies are engaged in this."

If completed, the waterway could permit the entry of sufficient tonnages of foreign ore produced and transported by cheap labor, he said, to seriously disturb market conditions in the Lake Superior district. The uncertainty which the St. Lawrence project would inject in the iron ore situation would tend to delay the taconite program indefinitely, he said.

In summary he pointed out that the "vast capital required for the taconite and jasper plants, estimated at 10 to 15 million dollars per million tons of product, probably would not be forthcoming until the effect of the St. Lawrence Waterway upon the iron and steel industries were revealed by operation of the project over some years. If the investment in these plants is not made, the steel industry would become more and more dependent upon the importation of foreign iron ore."

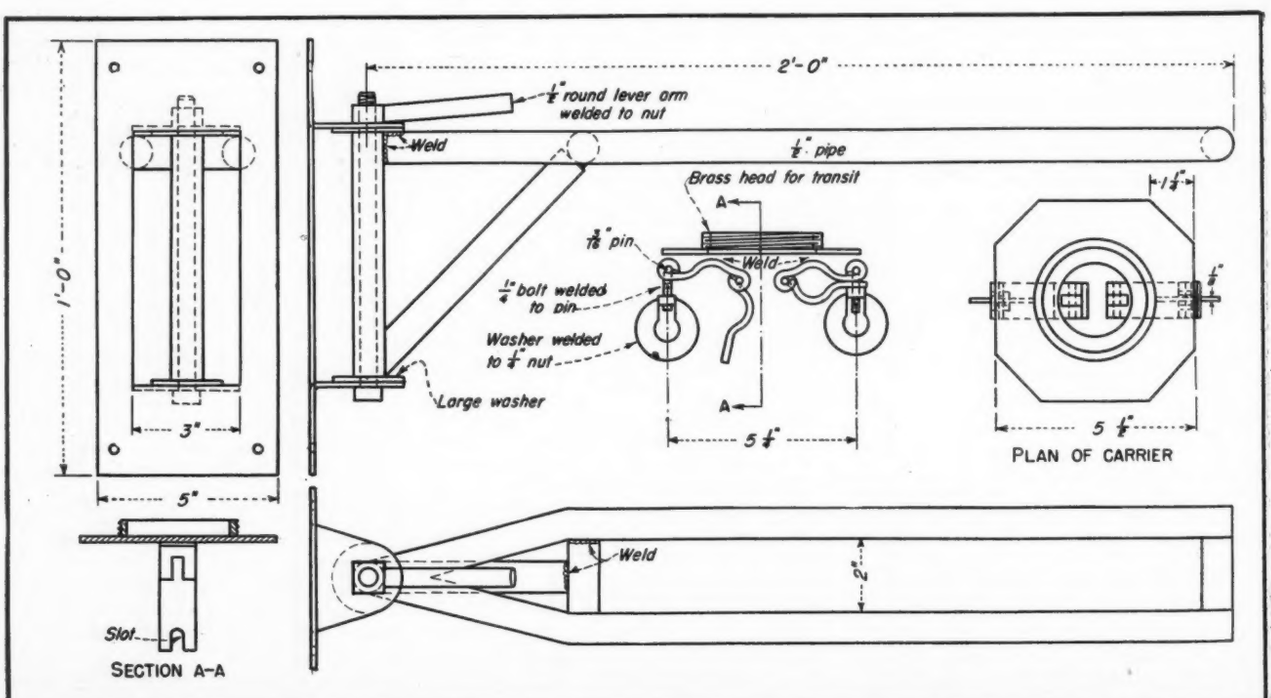
OPERATING IDEAS



Device Measures Ball-Mill Feed

When limited space prevented installation of a weighing device on a belt feeder to determine the ball mill feed per hour, K. K. Hood, manager, and E. B. Lowman, mill superintendent, Mt. Hope Division, Callahan Zinc-Lead Co., Eureka, Nev., evolved this measuring equipment. The dividing gate is lowered for a one-minute interval to deflect feed into the measuring box, and then raised to restore the flow of feed into the mill. Contents of the box are then weighed and multiplied by 60 to determine the hourly feed rate. By removing the illustrated lock bar, the measuring box may be pivoted forward and its contents dumped into the auxiliary opening in the cover of the scoop-feeder box of the ball mill. Details of the pipe support and lock bar are shown at right.

Adjustable Transit Bar



THE ADJUSTABLE TRANSIT BAR illustrated above has been used with success in the timbered manways of Bralorne Mines, Ltd., Bralorne, B. C., according to Swanston Gibson, chief engineer, who submitted this drawing of the equipment.

SAFE POWER

FULL SHIFT AVAILABILITY

is assured when the motive power is

EXIDE-IRONCLAD POWER

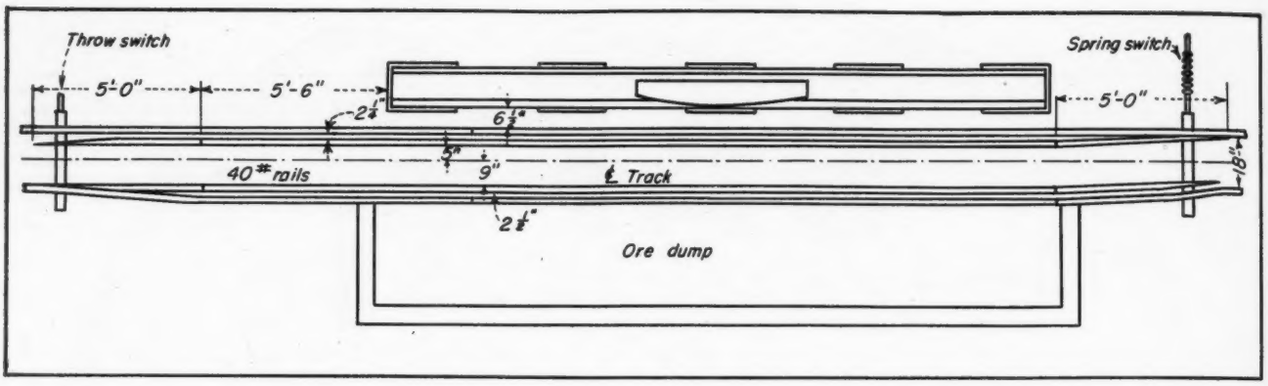
When your trammers, locomotives and shuttle-cars are powered by Exide-Ironclad Batteries, you can count on steady, uninterrupted haulage service straight through to the end of every shift.

This extra capacity is due to the fact that Exide-Ironclad Batteries differ from all others in design, construction and performance. A major difference of Exide-Ironclad construction is in the positive plate. This consists of a series of slotted, hollow tubes which contain the active material. So fine are these slots that, while they permit easy access of the electrolyte, they prevent the active material from readily washing out.

The results are higher power ability, a higher maintained voltage throughout discharge and a higher electrical efficiency. When your batteries are Exide-Ironclads, you can count on maximum dependability, long life and ease of maintenance.

If you have a special battery problem, or wish more detailed information, write for booklet Form 1982.

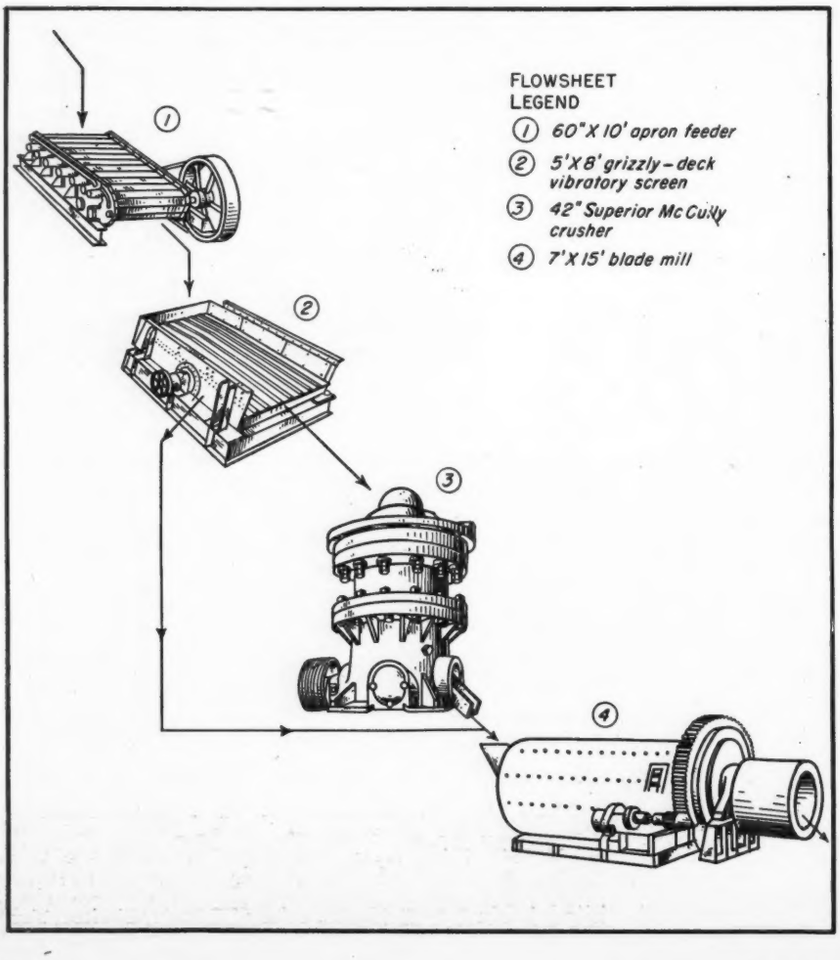
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto



Empty Granby-Type Cars Bypass Dump Cradle

Granby-type mine cars which have been unloaded with conventional dump cradles, must generally be hauled past the dumping cradle on the return trip to the mine. To permit empty cars to bypass the dumping cradle and avoid engaging it on the return trip, the Homestake Mining Co., Lead, S. D., employs the above illustrated system of parallel tracks and switches. The loaded cars approach from the left, follow the set of rails nearest the cradle, and are dumped as they pass the cradle. After all cars have been unloaded, and hauled beyond the spring switch at the right, the train reverses its direction. The spring switch then causes the cars to travel along the set of rails nearest the dump, and thus bypass the dumping cradle. The throw switch may be used to bypass empty cars approaching from the left.

Graphic Flow Charts Made Easily



Consulting engineers, manufacturers and mining companies can prepare flow charts easily by using rubber stamps to represent types of equipment, as shown in this flowsheet prepared by Stanley D. Michaelson, director, Basic Industry Research Laboratory, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Perspective line charts were first prepared from equipment photographs. Then zinc cuts were made from the sketches, and rubber stamps were moulded from the zinc cuts. The stamps are used with a stamp pad saturated with an opaque-type, black, stamp-pad ink. Each stamp is used to make an impression of the proper machine, and the flow lines are inked in later. When the stamps are used on good tracing paper, good prints can be made from the originals. The accompanying fictional flowsheet is made from a complete set of 40 stamps. One descriptive flowsheet which required 1½ hr. to prepare, was made with rubber stamps in ½ hr. Estimated drawing time for an equivalent pictorial flowsheet by a draftsman was 8 hr.

Each stamp requires the preparation of an electrolytic zinc cut which costs about $3.

Want to soften up a tough job?

There's a simple way to do it! Make your toughest handling job a routine task by using Maltese Cross conveyor and elevator belting.

This famous belting—preferred by mine and quarry operators for more than a generation—is back on the job again. Once more, we have the premium-quality materials needed for its construction.

Maltese Cross brings to your jobs *extra* strength, *increased* flexibility, *longer* service life. It excels on tough assignments because:

1. Special Hewitt-developed rubber compounds provide maximum resistance to impact, abrasion, weathering, aging, heat, sun-checking.
2. Selected staple cotton reinforcement increases strength, reduces stretch.
3. High-flexing, resilient rubber frictioning between plies maintains maximum adhesion.
4. Scientifically treated belt carcass virtually eliminates mildew.
5. Extra layers of highly elastic skim rubber give added cushioning to shock loads and assure perfect troughing.
6. Special Dura-bond breaker strip permanently anchors cover to carcass.

Maltese Cross conveyor and elevator belting comes to you in straight-ply, stepped-ply or shock-pad construction, depending upon your needs.

Why not investigate Maltese Cross? Phone the Hewitt distributor listed in the yellow pages of your telephone directory. Or write Hewitt Rubber Division, 240 Kensington Ave., Buffalo 5, N. Y.

You can depend on your industrial supply specialist

He's always ready to serve you. And he knows your job . . . your operations . . . your problems. Call on him at any time for advice. He'll recommend the exact Hewitt product especially designed to help *improve* the efficiency of your operations.

HEWITT-ROBINS INCORPORATED

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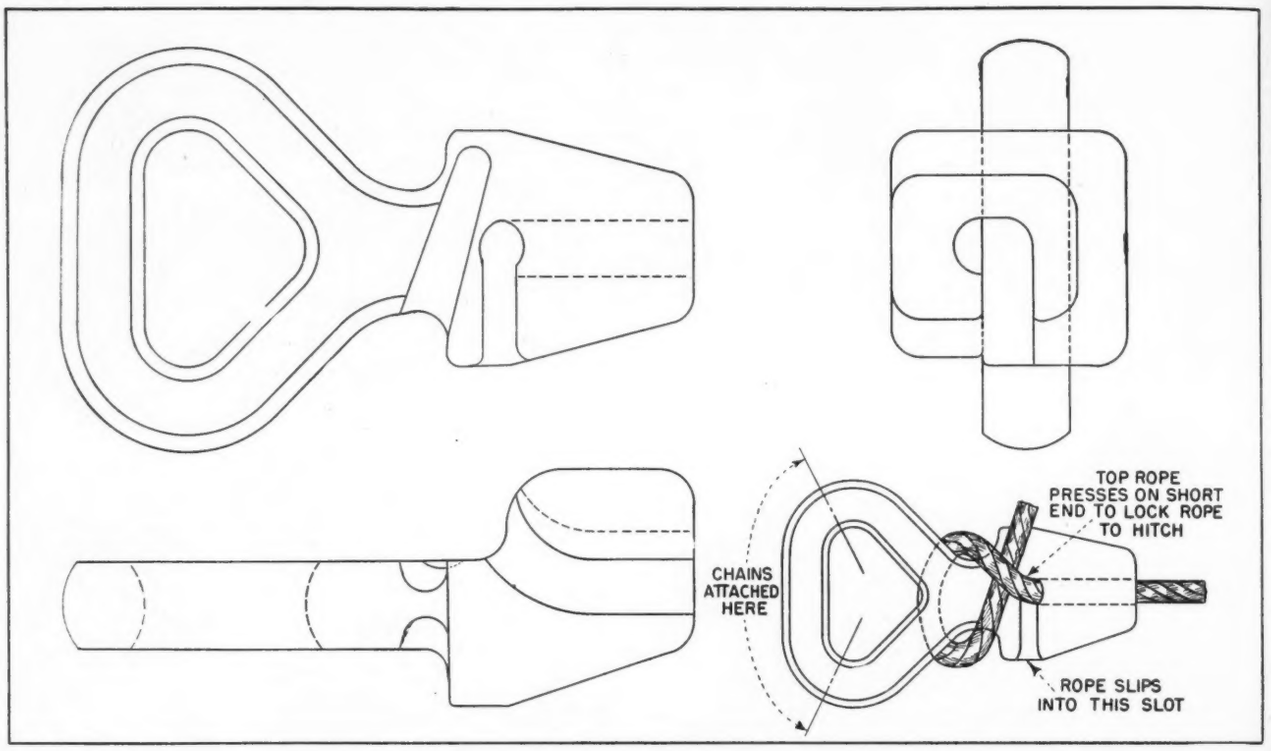
INDUSTRIAL HOSE • BELTING • PACKING

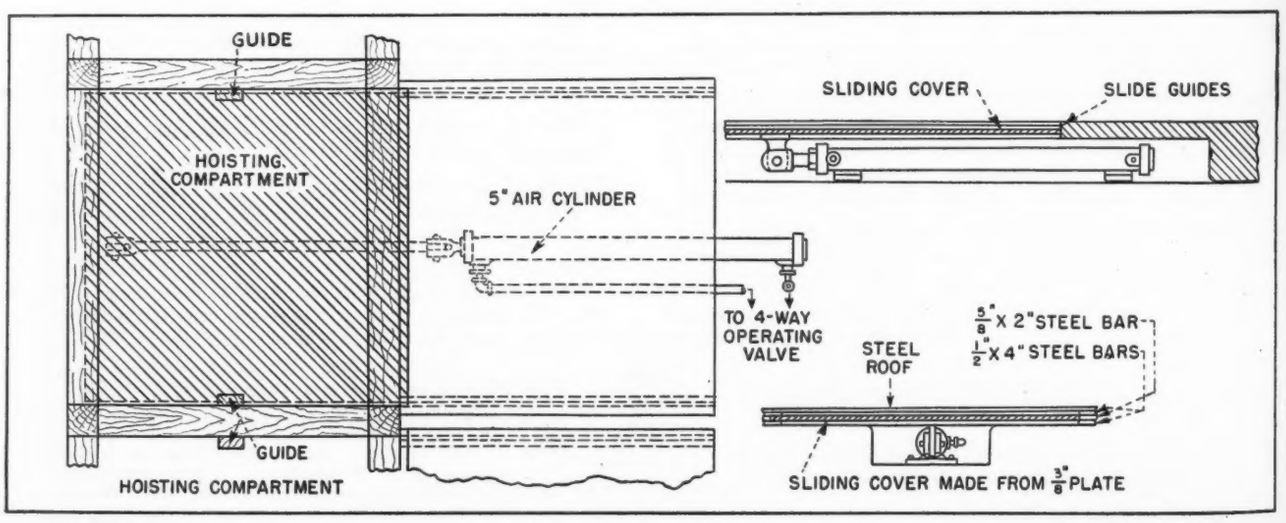
Maltese Cross Belting

Tail-Rope Hitch for Scrapers



This type of tail-rope hitch is used at the Climax Molybdenum property, Climax, Colo. Two chains mounted on the rear of the scraper are attached to the large opening in the hitch. The tail rope is attached to the hitch as shown above. No clevises or other devices are necessary to make the attachment. A 1⅛-in. cable may be changed in a few minutes without tools. When the rope is pulled tight by the scraper-hoist, the short end of the rope is locked securely in place.

Air-Operated Plates Cover Shaft Compartments



This air-operated retractible shaft cover was devised by Joe Glennon and Austin Boreham, mechanical department, Idaho Maryland Mines Corporation, Grass Valley, Calif., to facilitate such maintenance work as cable inspection and lubrication, and skip and cage repair. The units serve two hoisting compartments of the Brunswick shaft.

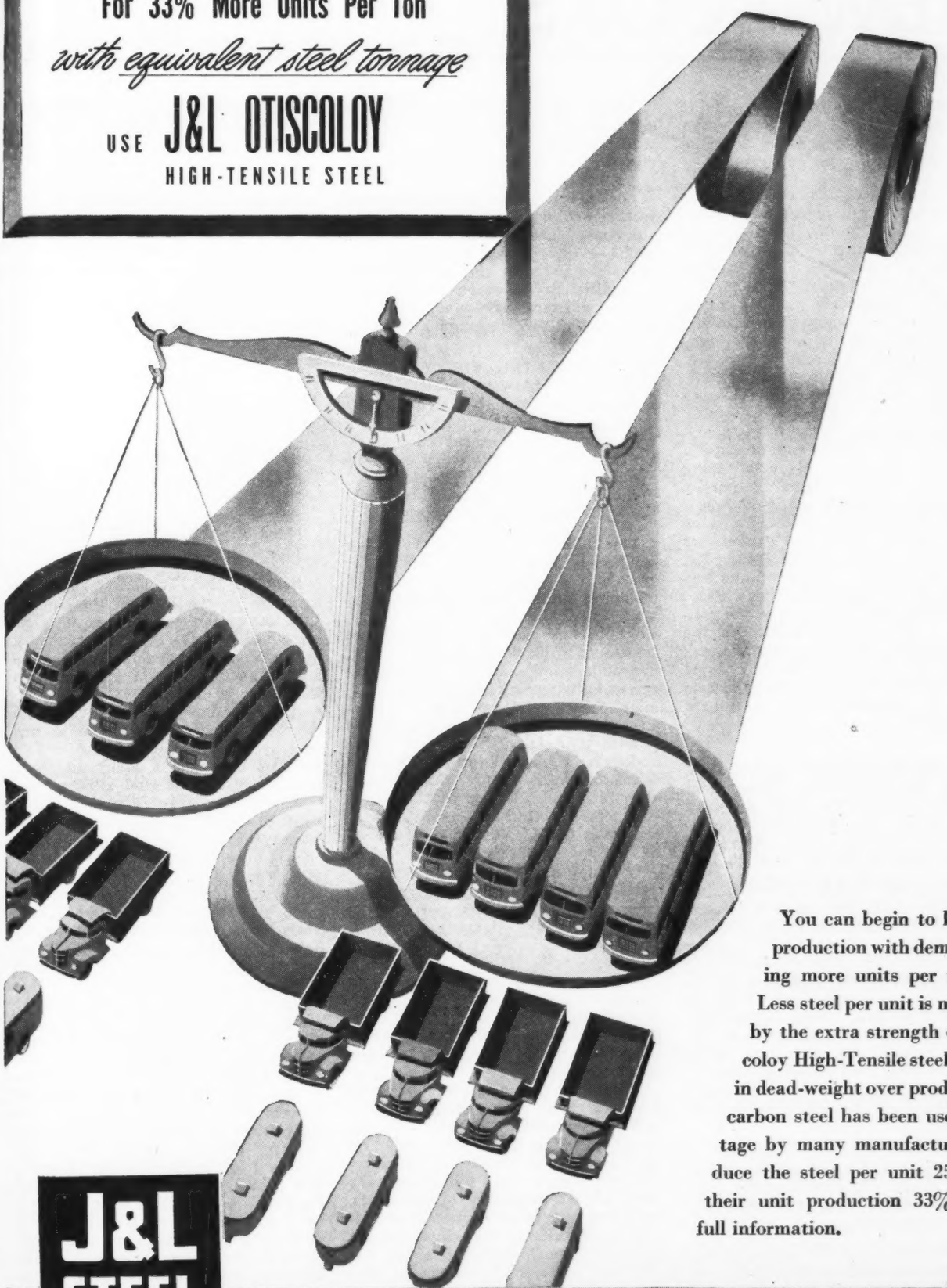
A sheet of ⅜-in. steel is pushed across the compartment by a 5-in. air cylinder operated by a four-way valve installed at a convenient place on or near the headframe. The cover slides between two ½x4-in. steel guides as shown. The wooden shaft guides support the cover when it is thrust across the shaft for repair or maintenance work.

For 33% More Units Per Ton

with equivalent steel tonnage

USE J&L OTISCOLOY

HIGH-TENSILE STEEL



You can begin to balance your production with demand by making more units per ton of steel. Less steel per unit is made possible by the extra strength of J&L Otiscoloy High-Tensile steel. This saving in dead-weight over products made of carbon steel has been used to advantage by many manufacturers who reduce the steel per unit 25%, increase their unit production 33%. Write for full information.

J&L STEEL

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PITTSBURGH 30, PENNSYLVANIA

NEW BOOKS

BRAINERD, 1871-1946. By Carl Zapffe. Published under the auspices of the Brainerd Civic Association, Brainerd, Minn. Pp. 224.

Commemorating Brainerd's Seventy-fifth Anniversary, celebrated in June, 1946, the book chronicles, decade by decade, the details of the growth of this town, up near the headwaters of the Mississippi, and of the personalities of the individuals who had a part in its development, as well as of others who just happened to be there. Farming, lumbering, railroading, mining, tourist travel, and miscellaneous business have contributed to the community's prosperity. The region immediately to the east, it turned out, contained iron ore and became the Cuyuna range or district, the name being coined by Cuyler Adams, of nearby Deerwood, the discoverer of the occurrences. The author, a geologist, came to the district in 1906 to explore for iron ore for the Northern Pacific Ry. Co. (and another company) and has continued a resident ever since. Since 1922 he has been manager of the railroad's iron ore properties. In the hands of many another writer, the task of writing Brainerd's history could have resulted in a chronicle as dry as dust. Mr. Zapffe's story is full of human interest.

MINERALS YEARBOOK FOR 1945. U. S. Bureau of Mines, Department of the Interior. Pp. 1,689. Price $4. Obtainable only from the Superintendent of Documents, Government Printing Office, Washington, 25, D.C.

Written and edited by commodity specialists in the Bureau of Mines, the Minerals Yearbook returns to pre-war scope and coverage, including many features that were discontinued during the emergency. The foreign minerals section has been expanded. Data are presented on production, distribution, and consumption of metals, non-metallics, and fuels. All of the individual chapters have been issued in preprint form during 1946, and are still available separately at prices ranging from 5c to 20c.

IGNEOUS MINERALS AND ROCKS. By Ernest E. Wahlstrom. John Wiley & Sons, Inc., New York. Pp. 367. Price $5.50.

Seeking to serve the advanced student who may wish to classify igneous rocks by microscopic methods as well as the student just beginning in microscopic igneous petrography, the author (who teaches at the University of Colorado) assumes that the user of this book will have had some training in the theory and techniques of optical crystallography. The subject of the title is treated in two parts, on igneous minerals and igneous rocks respectively. Forty-seven pages of tables for mineral identification are an important feature of Part I. Changing rock classifications and nomenclature have added to the author's difficulties in preparing so highly specialized a book. In addition to its major purpose, the volume will serve as a handy reference with respect to petrographic terms.

PLACER MINING FOR GOLD IN CALIFORNIA. By Charles Volney Averill. Bulletin 135, published by Division of Mines, California Department of Natural Resources, Ferry Bldg., San Francisco, 11, Calif. Pp. 377. Price: paper, $2.00; cloth, $2.50. (California residents add 2½% sales tax.)

This bulletin covers the following subjects relating to placer mining for gold in California: Mining methods, including small-scale, dragline, dryland, dredge, bucket-line dredge, single-bucket dredge; jigging and treatment of black sand; drift mining, hydraulic mining, debris dams; geology and prospecting of placer deposits; mine descriptions by counties; laws affecting placer mining, including the Caminetti Act; restrictions of Fish and Game Code and for protection of domestic water supply. Contributing authors include: Frank W. Collins, L. L. Huelsdonk, Olaf P. Jenkins, P. Malozemoff, C. M. Romanowitz, H. A. Sawin, and H. H. Symons.

THE ROME CABLE MANUAL OF TECHNICAL INFORMATION. Published by Rome Cable Corporation, Rome, N. Y. Pp. 263. Price, $2.50.

This convenient pocket-size manual represents the first attempt in several years to present useful wire and cable data for engineers, and others responsible for the safe installation of electrical circuits.

These are some of the subjects treated: wire and cable technical tables; engineering calculations; national electrical code data including dimensions, cable types, current-carrying capacities, conduit fill, and voltage drop tables; properties of materials, including resistance of metals and alloys and insulating materials; general technical information, including a.c. and d.c. formulas, connection diagrams for motors and transformers, motor ratings, color codes, power factor correction data, humidity tables, and thermocouple data; conversion tables; and a number of useful mathematical tables.

YEARBOOK OF THE AMERICAN BUREAU OF METAL STATISTICS—1946. Published by the American Bureau of Metal Statistics, 33 Rector St., New York, N. Y. Pp. 112. Price $3.

This, the 26th annual edition of this well-known statistical summary of the nonferrous metals industry, covers production and consumption everywhere in the world except in those countries "behind the iron curtain." As in the past, this book is clearly recognizable as the best, if not the only, source of complete information on the disposition of the end products of metal mining.

BEVIN BOY. By Derek Agnew. Published by George Allen & Unwin, Ltd., London. Available in United States from The Macmillan Co., 60 Fifth Ave., New York, N. Y. Pp. 140. Price $1.75.

Back in 1941, it became only too apparent to the English Government that loss of the war could result from the collapse of the British coal mining industry, which was imminent as a result of the drainage of manpower from the mines to the armed services. Ernest Bevin, minister of labor, led the effort to do something about it, and thereby unwittingly supplied a title for this book and a nickname for a new generation of coal miners.

Men were recalled from the army to work in the mines. No further miners were taken. Also, young boys had their choice of entering the army or the pits, when they were drafted. These latter were the "Bevin Boys," and they form the subject of this book. The author was himself a Bevin Boy by deliberate choice in order to discover and report on what was going on in the coal mines of Britain.

There is no need to argue with the author's estimates of what he lived through in the coal mines, or of what others told him. He has his opinions, of course, and he is entitled to them. To an American reader the chief and absorbing interest of this book is in its picture of a nationalized mining industry that is also far below our standard of mechanization. Reading this book, and making due allowance for the author's lack of prior acquaintance with mining, it is still possible to see why many men grew bitter over being forced to work in such mines, and why some of them chose jail or the firing line instead, even those who had little desire to die a hero's death. Coal mining isn't fun, exactly, even in the best of places, but the British miner seems to have to go out of his way to make it harder.

Can I fill my Hose Requirements with pre-war quality goods?

Your Thermoid Distributor Will Know!

He will tell you *No.* Today's products carrying the Thermoid trade mark are even better than pre-war quality. War born experiences plus latest technical advances provide the added quality. This new quality is in production . . . it is no longer necessary to take whatever you can get.

He can also tell you—

That Thermoid hose is made in a wide range of types and sizes. And, every type measures up to the service conditions for which it is sold.

He knows something about Thermoid too—

Thermoid concentrates its manufacturing for industry on the well integrated line shown below. The Company itself, is large enough for precise, low cost, high quality production, but small enough to be quickly responsive to customers' specific problems. That's one of the reasons why—

It's Good Business To Do Business With Thermoid!

A postcard or a letter to the home office will bring his name and address to you.

Manufacturers of new equipment are invited to correspond direct with the home office.

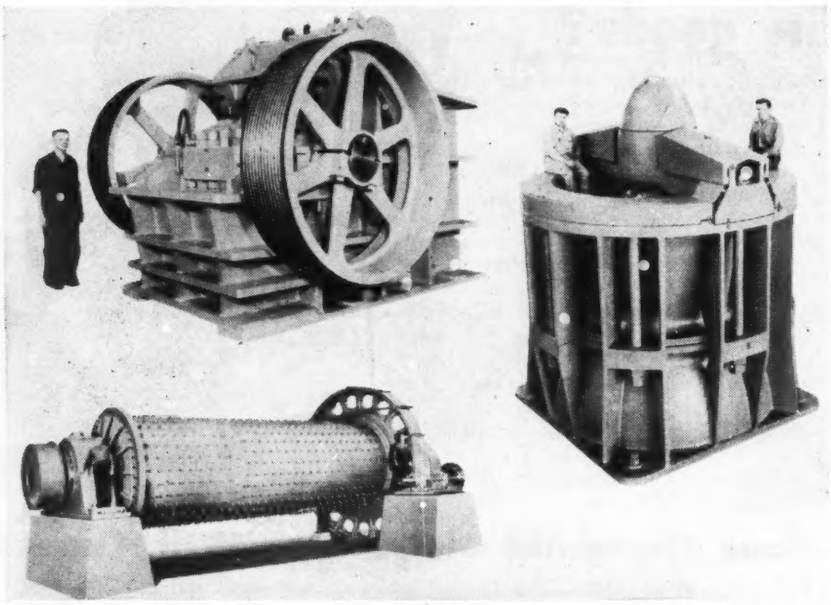
Thermoid
PRODUCTS FOR INDUSTRY
BUILT FOR THE JOB
QUALITY · VALUE · SERVICE

Thermoid Products

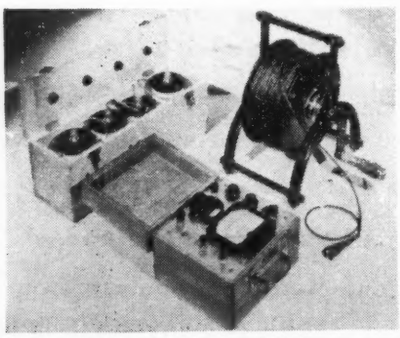
Automotive • Industrial
Oil Field • Textile
Thermoid Company, Trenton, N. J., U. S. A.

The Thermoid Line Includes: Industrial Brake Linings and Friction Products • Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Custom Molded Parts.

EQUIPMENT NEWS



THREE SAMPLES of the heavy-duty primary rock crushing and grinding machinery now being produced by the Process Machinery Division of Nordberg Manufacturing Co., Milwaukee, 7, Wis. Shown are: a 36x48-in. jaw crusher, which comes in sizes up to 72x96-in.; a 30-in. gyratory, available in sizes up to 72-in.; and a 9x32-ft. grinding mill, made in sizes from 6 to 10 ft. in diameter, up to 50 ft. long.

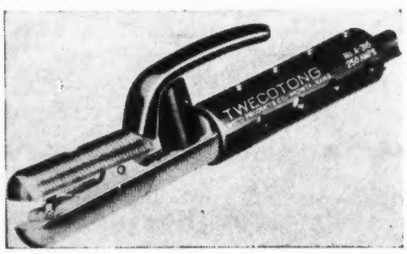


For Electrical Prospecting

Two geophysical prospecting outfits have recently been announced by Geophysical Instrument Co., 1820 North Nash St., Arlington, Va. Brief descriptions follow, and full details are available from the manufacturer.

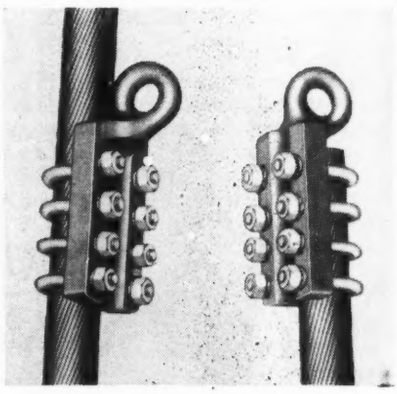
The company offers a complete outfit for prospecting by the spontaneous polarization method, which is effective for orebodies that have a self-potential measurably different from the country rock. The method consists of placing two non-polarizing electrodes in contact with the earth at selected stations and reading the natural potential difference between them. This will be highest near the orebody. Ores high in pyrite or graphite are examples of the type that may be sought in this manner.

The company also offers an outfit to make use of the Gish-Rooney earth resistivity method, worked out by Messrs. Gish and Rooney over 20 years ago at the Carnegie Institution in Washington. The apparatus is said to be suitable for oil and mineral prospecting to depths of 500 ft. (by outlining geological conditions), and for ground water prospecting or civil engineering sub-surface investigations.



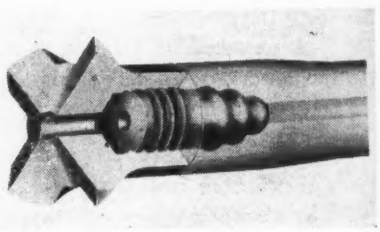
Electrode Holder

Tweco Products Co., Wichita, Kansas, announces a new addition to its line of insulated tong-type electrode holders in order to fill the requirements of the average job or maintenance welder using 200-amp. equipment. Called the A-316, the new Twecotong features light weight and compactness, yet it provides a 95-lb. bite on a 3/16-in. electrode. Tip and body insulation is molded, laminated, glass cloth bakelite, using the patented tubular-keyed Tweco design. Neoprene covers the insulated spring.



Heavy Cable Holder

Ends or centers of heavy electrical cables are held securely by means of the new cable holder recently announced by Mosebach Electric & Supply Co., 1115 Arlington Ave., Pittsburgh, 3, Pa. Among typical uses for the holder are suspending cables in drill holes, pulling cables behind locomotives. The three sizes of holder furnished will carry cables of from 211,600 cm. to 1,500,000 cm. in size.



Studs for Drill Bits

Extensive shop and field research to develop an improved detachable rock drill bit and connection has produced the new Ingersoll-Rand Stud Jackbit system, which the manufacturer states is designed to use materials best suited for the functions peculiar to each. By means of carefully designed wing curves, the bit retains new-bit proportions through many re-sharpenings. The resulting small gage loss permits using successive bits with reductions in diameter of $\frac{1}{16}$-in. or less per change. Smaller holes may be started than were possible formerly, yet bottom diameters will be the same.

The Jackstud, which connects the bit to the drill rod, is made of high-grade carburized alloy steel selected to withstand this service. One end of the

GOULD AND PHILCO

JOIN HANDS TO BRING YOU

BETTER BATTERIES...
BETTER SERVICE...
BETTER DELIVERIES...

THE Storage Battery Division of Philco Corporation joined forces with the Gould Storage Battery Corporation on June 28, 1947.

Together, we can give you better batteries, faster deliveries, and better service than either of us could alone.

The consolidated organizations will operate under the name of Gould.

Both the Gould plant at Depew, New York, and the former Philco plant at Trenton, New Jersey, will continue to produce at full capacity, industrial storage batteries of the same high quality as heretofore.

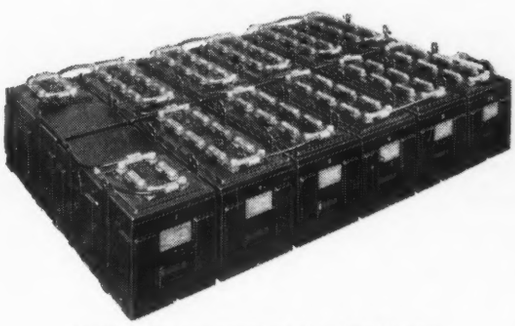
The sales and service organizations of Philco and Gould will be blended together to give you most outstanding service.

The facilities of the new, modern Gould Laboratory at Depew, New York, will bring to both Philco and Gould users all technological advances now in development.

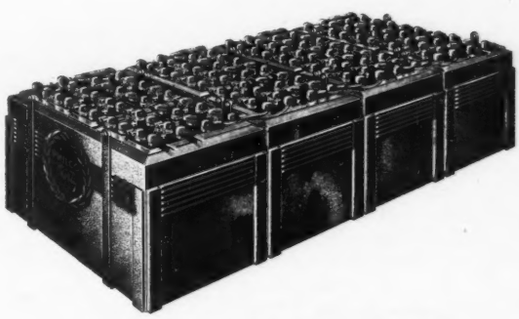
We, the united personnel of Gould and Philco, can offer you better service and faster deliveries — now! We promise you even better batteries for tomorrow.

President

Gould Storage Battery Corporation



● *Batteries produced at the Gould plant, Depew, New York, will continue to be designated by the familiar Gould name and trade mark. For example, Gould types KHD, KTD and KMD will continue to carry the same identity.*



● *The name "Philco" on batteries produced at Trenton will gradually be replaced by the name "Gould". For example, Philco "Thirty" types XL-P and XVL-P will be called Gould "Thirty" XL-P and XVL-P.*

GOULD STORAGE BATTERY CORPORATION

TRENTON, NEW JERSEY — DEPEW, NEW YORK

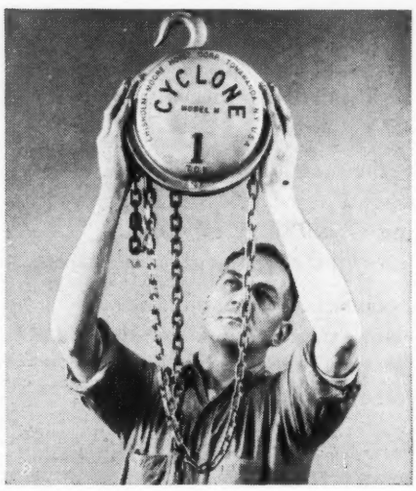
GOULD

"Thirty" and **KATHANODE** **BATTERIES**

For Gould Service call Gould in the following cities: Boston, Mass. • Cincinnati, Ohio • Cleveland, Ohio Chicago, Ill. • Denver, Colo. • Depew, N.Y. • Detroit, Mich. • East Point, Ga. • Kansas City, Mo. • Los Angeles, Cal. • New York, N.Y. • Philadelphia, Pa. • Pittsburgh, Pa. • St. Louis, Mo. • St. Paul, Minn. • San Francisco, Cal. • Trenton, N.J. • Washington, D. C. • West Salem, Ore. • Kingston, Ont., Canada

stud is driven while cold into the heated end of a drill rod, an operation easily performed with a drill sharpener. The projecting end of the stud has improved reversed buttress-type threads, case-hardened to resist wear. These threads extend up to the driving shoulder of the bit and therefore leave no undercut into which the bit skirts can upset and become locked. These bits come off easily.

Additional information on the new bits is available in Form 4062, furnished by Ingersoll-Rand Co., 11 Broadway, New York, 4, N. Y., or any of its branch offices.



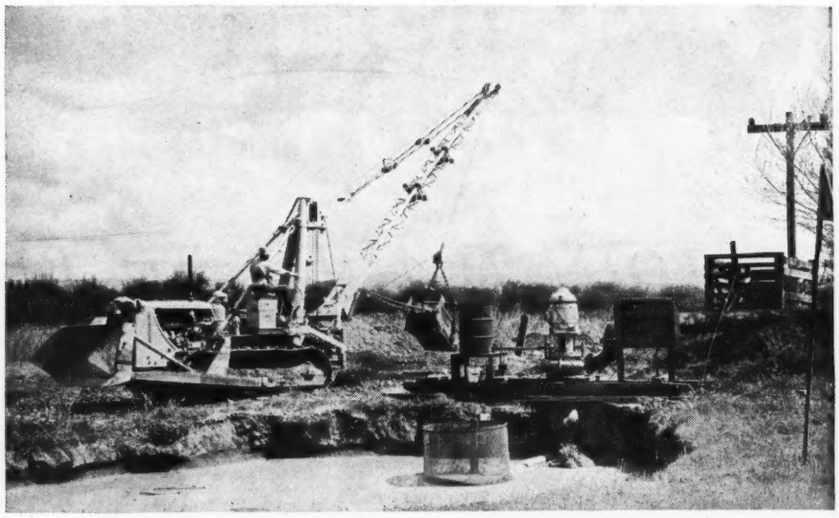
Light Efficient Hoist

Chisholm-Moore Hoist Corporation, Tonawanda, N. Y., announces a line of new high-speed hand hoists that are said to be 96% mechanically efficient and nearly 45% lighter in weight than standard hoists of comparable capacity.

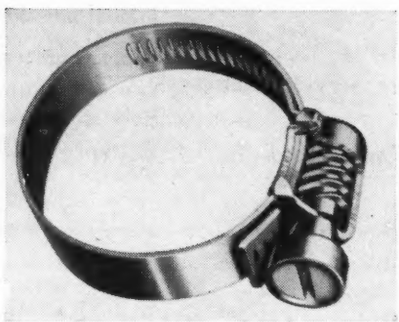
Use of steel and aluminum alloys has reduced both weight and bulk in the new hoists, and the number of component parts has also been cut. All rotating parts are fitted with precision ball bearings with life-time lubrication. Known as the Model M, the new hoists are available in four standard capacities: ¼, ½, 1, and 2-ton. Several operating advantages, other than low weight and high efficiency, are cited by the manufacturer.

Pump Motor

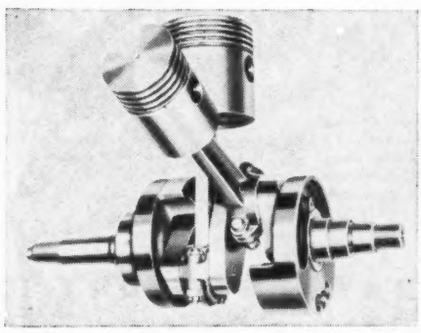
Designed specifically for pump drives, a new hollow-shaft vertical motor has been added to the line of General Electric Tri-Clad induction motors. Available in ratings from 1 to 500 hp., all speeds and frequencies, the new motor is suitable for use on irrigation projects, deep-well turbine pumps, mine dewatering pumps, or other process or water-supply projects. For complete details, ask for Bulletin, GEA-4645.



COMBINED CRANE AND BULLDOZER at work on the property of Snelling Gold Dredging Co., Snelling, Calif., W. A. McCollum, dredgemaster. The unit, a Caterpillar D7 equipped with 7S bulldozer and Hystaway ½-yd. bucket, is digging a water supply ditch for the dredge pond.



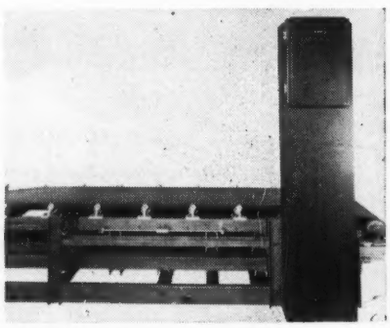
HOSE CLAMPS, using a worm drive principle that is said to provide greater strength and ease of application, are now offered by Aircraft Standard Parts Co., Rockford, Ill. A free sample will be sent on request to the manufacturer.



Smooth Compressors

Development of a new type of crankshaft that is reputed to eliminate air compressor vibration and greatly increase compressor life is announced by Davey Compressor Co., Kent, Ohio. Unlike ordinary shafts the new Davey unit spreads compressor working strokes evenly over the 360 deg. of rotation. In 60 and 105 c.f.m. V-type compressors, the new design uses a two-throw crankshaft (illustrated) with throws spaced at an angle that is the supplement of the V. In conventional 60-deg. compressor arrangements, throws are spaced at 120 deg.

The company states that for the first time in air compressor construction, working strokes are evenly spaced, and the rocking motion set up in ordinary vertical compressors has been eliminated. The new design also does away with the vibration resulting from unbalanced piston action in standard V-type units. The company's engineers estimate that efficient compressor life may be extended by 50% by using the balanced crankshaft.



Scale for Conveyors

Use of diaphragms, instead of the knife-edge principle, features the activating units of the new Conveyoflo Meter, a means of continuously weighing and recording the quantity of material carried by conveyor belts. Built by Builders-Providence, Inc., Providence, R. I., the unit fits under the conveyor belt, as shown, without overhead framework or attachments. The weighing section is supported at one

end by ball-bearing pillow blocks, and at the other end is "floated" on a diaphragm that transmits load changes hydraulically to the weighing mechanism. The totalizer is automatically corrected for variations in belt speed or weight, and for the effect of material clinging to the belt as it returns. The Conveyoflo may be used to control rate of feed, as of flow of ore to a ball mill.

Goggle for Hot Work

Made especially for work in hot and humid atmospheres, a new rubber-frame safety goggle has been announced by American Optical Co., Southbridge, Mass. Feature of the goggle is an ingenious nosepiece with an inhalation and exhalation valve that prevents fogging of the lens by directing a stream of air across it as the wearer breathes.

INDUSTRIAL NOTES

Timken Roller Bearing Co., Canton, Ohio, plans to open a new plant in Colorado Springs, Colo., this fall to make Timken detachable rock bits. Output of the plant will be about 10,000 bits daily, and about 125 persons will be employed.

Laclede-Christy Clay Products Co., St. Louis Mo., announces the following appointments: **M. C. Michels**, chief engineer; **John B. Ives**, manager of operations, which includes manufacturing and mining at St. Louis and Toledo; **Paul J. Maddox**, general sales manager of the refractories division.

William D. Pretts, mining engineer, has been transferred to the mining section of the basic industries division of **Allis-Chalmers Mfg. Co.**, Milwaukee, Wis.

Walter H. Curry, vice-president of the Galigher Co.. Salt Lake City, Utah, died on May 7, 1947.

R. G. LeTourneau, Inc., Export Division, announces the opening of a sales office at 37 Wall St., New York, N. Y. **Paul King** is in charge.

Barber-Greene Co., Aurora, Ill., announces the appointment of **Wayne D. Adamson** as advertising manager.

Hardinge Company, Inc., York, Pa., announces a new address for its San Francisco office at 24 California St., San Francisco, 11, Calif.

Western Machinery Co. has opened a sales office at 6 North Michigan Ave., Chicago, Ill. **Robert Bailey** is in charge.

Philco Corporation announces that its storage battery division has been taken over, and will be operated, by **National Battery Co.** as a consolidation with its Gould Storage Battery Corporation.

E. M. Platts, formerly in charge of coal mining sales for **Joy Manufacturing Co.**, Pittsburgh, Pa.. has been made vice-president in charge of sales for all Joy equipment.

Kipp-Kelly, Ltd., Winnipeg, Canada, announces the appointment of **H. R. Sheppard** as vice-president and sales manager, and **R. M. Colman** as manager of the mining and contracting department.

BULLETINS

Filter Media. T. Shriver & Co., 808-864 Hamilton St., Harrison, N. J., has prepared a bulletin (No. 123) describing their stock of filter media, including cotton, synthetics, wool, rubber, glass, metal, asbestos, and paper.

Pedestal Pumps. The operating advantages and construction features of its new line of Pedrifugal, pedestal-type centrifugal pumps are explained in Bulletin 52B6691 of Allis-Chalmers Mfg. Co., Milwaukee, 1, Wis.

Humphreys Spirals. Details of value to to spiral installations at metal mines may be found in Bulletin No. 6 of Humphreys Investment Co., First National Bank Bldg., Denver, Colo., which describes a spiral plant for washing anthracite silt.

Drill Bits. The latest design of Hayes P&M detachable rock drill bit is described in a new bulletin of Hayes Steel Products Ltd., Merriton, Canada.

Free Computer. W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago, 44, Ill., has prepared a slide-rule-type computer for calculations involving specimen size, breaking strength, lb. per sq. in., in testing materials. This computer will be sent free to engineers and educators giving name and company, or institutional, connection.

Engineering Review. Copies of the Allis-Chalmers annual engineering review are again available for general distribution. The review covers the company's activities in various industrial fields during 1946. Address Allis-Chalmers Mfg. Co.. Milwaukee, 1, Wis.

Timber Structures. Use of Teco timber connectors to strengthen and assist in building timber structures is described in a new publication of Timber Engineering Co., 1319 Eighteenth St., N. W., Washington, 6, D. C.

Small Prime Mover. The new small Tournapull (Nodel D) built by R. G. LeTourneau, Inc., Peoria, Ill., is described in a new folder.

Power Shovels. Power shovel dippers, shovel and dragline parts, and the part played therein by manganese steel are discussed in a new bulletin, 547-DS, recently issued by American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill.

Nickel Alloys. A compressed metallurgical handbook called, "Nickel and High Nickel Alloys," is now available on request to International Nickel Co., Inc., 67 Wall St., New York, 5, N. Y.

Silver Brazing. A new silver brazing alloy, Easy-Flow 45, is described in a new bulletin of Handy & Harman, 82 Fulton St., New York, 7, N. Y.

Conveyors. A general catalog describing a line of stationary and portable conveyors is now available from Trowbridge Conveyor Co., Clifton, N. J.

Flat Rubber Belts. Much technical data on selection and maintenance of rubber transmission belts is contained in a 12-page catalog section just issued by B. F. Goodrich Co., Akron, Ohio.

Squirrel-Cage Motor. A large wall chart showing a detailed, cutaway drawing of a new two-pole, 3,600 rpm., squirrel-cage induction motor in ratings from 200 to 700 hp., is available from Electric Machinery Mfg. Co., Minneapolis, 13, Minn.

Bulldozers. Three sizes of straight blade, cable-controlled bulldozers made by Caterpillar Tractor Co., Peoria, Ill., are described in a new booklet, Form 10225.

Dewaterer. Use of a new screen, the Robins Eliptex Dewaterizer, for reducing surface moisture on fine coal is described in a new bulletin, No. 129, available from Robins Conveyors Division, Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J.

Flexible Couplings. Flexible couplings designed for light and medium loads are described in a catalog page of Thomas Flexible Coupling Co., Warren, Pa.

Surface Pyrometers. Catalog 160 of The Pyrometer Instrument Co., 103 Lafayette St., New York, 13, N. Y., describes in detail a new instrument for measuring surface and sub-surface temperatures.

Magnets. A new booklet on G-E permanent magnets has been prepared by the metallurgy division of General Electric Chemical Department, Pittsfield, Mass.

Machine Tools. Cincinnati Shaper Co., Cincinnati, Ohio, have prepared catalogs on their shapers, press brakes, and squaring shears, all of which will be exhibited at the Machine Tool Show in Chicago, Sept. 17 to 26.

Automatic Couplers. The economies obtained through use of automatic couplers for mine cars are described in a new folder of Ohio Brass Co., Mansfield, Ohio.

Slurry Pumps. Performance charts showing how to select a slurry pump to secure maximum life of the wearing parts, are a feature of a new slurry pump bulletin available from Morris Machine Works, Baldwinsville, N. Y.

Dragline Buckets. How to get the most out of a Page automatic dragline bucket is the subject of a new 20-page bulletin of Page Engineering Co., Chicago, Ill.

Facts and Figures. A reference booklet, containing a great deal of assorted reference data of value to engineers in the mining and quarrying industries, is now available on request to Pioneer Engineering Works, Inc., 1515 Central Ave.. Minneapolis, 13, Minn. The booklet, *Facts and Figures,* is in its ninth edition.

Diesel Engines. Two new pamphlets are being distributed by International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., covering the company's new UD-14A and UD-18A diesel engines and power units. These are 76hp. and 125hp. units, respectively.

Machine Tool Motors. The advantages of totally-enclosed motors for use with machine tools are discussed in a new booklet of Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis 14, Mo.

Mine Machine Parts. Renewal and spare parts for Jeffrey equipment for mines are illustrated and described in booklet 799, recently issued by Jeffrey Mfg. Co., Columbus 16, Ohio.

Electronic Controls. Listings and specifications for electronic instruments for a variety of industrial control purposes are given in a new 20-page catalog of Wheelco Instruments Co., 847 West Harrison St., Chicago 7, Ill.

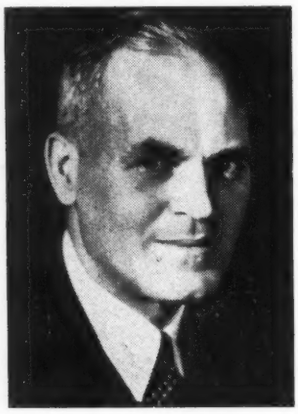
Synthetic Ammonia. A complete description of N. E. C. process synthetic ammonia plants is provided in a new booklet prepared by Chemical Construction Corporation, 350 Fifth Ave., New York 1, N. Y.

Roof Maintenance. Materials available for roof maintenance are discussed in a new bulletin of Stonhard Co., 403 N. Broad St., Philadelphia 8, Pa.

Submersible Pumps. A deepwell turbine pump and electric motor unit, known as the submersible pump, that operates entirely submerged in water at any depth, is described in Bulletin 46-5000, available from Byron Jackson Co., Box 2017 Terminal Annex, Los Angeles 54, Calif.

PERSONAL NEWS

James P. Margeson has been elected executive vice president of International Minerals & Chemical Corporation. Since 1942 Mr. Margeson has been vice president in charge of the mining and distribution of potash. He



JAMES P. MARGESON

joined the company in 1940 as assistant to the president. During the war he supervised the construction and operation of plants which produced magnesium, potassium chlorate and fluorspar for the government. In his new capacity he will have such duties as are assigned by the president and will act for the president in his absence. **Edward D. McDougal, Jr.**, was elected corporation secretary and general counsel.

Harry C. Chellson, Market Research Manager for *Coal Age* and *Engineering and Mining Journal,* has been named District Manager for the two publications at Pittsburgh, Pa., succeeding Willis S. Drake. **Wm. H. H. Ginder, Jr.,** who this spring joined the publications, has succeeded Mr. Chellson as Market Research Manager.

Mr. Chellson brings to his new post a varied and extensive experience in mining in many parts of the world. Previous to rejoining McGraw-Hill in October, 1943, he had served as Editor of *Mining Congress Journal* and for some years prior to that had been Associate Editor of *E.&M.J.* Before joining the staff of *E.&M.J.*, he had been engaged in mining engineering, geology and operations in several parts of the United States, Mexico and Asia. He is a graduate of the New Mexico School of Mines.

Mr. Ginder, who is a graduate of Notre Dame in chemical engineering and metallurgy, was associated with the Carnegie Illinois Steel Corporation in the operating, metallurgical and sales departments. He is a registered professional engineer and is a member of the American Institute of Mining and Metallurgical Engineers, Coal Mining Institute of America, Illinois Mining Institute and the Engineers Society of Western Pennsylvania.

Patrick Butler, vice president, Butler Brothers, St. Paul, Minn., announces the respective appointments, effective July 15, of **Earl S. Mollard,** as manager of mines, **C. L. Wyman,** vice president in charge of sales, and **Peter Warhol,** vice president in charge of operations.

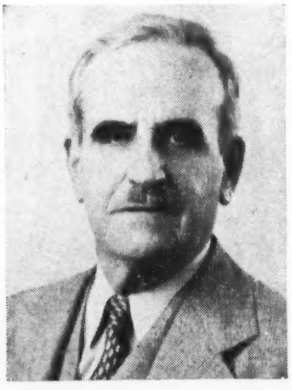
F. A. Flodin, president of Lake Shore Engineering Co., at Iron Mountain, Mich. has been elected to the board of control of Michigan College of Mining and Technology, Houghton, Colorado.

A. L. Engels has resigned as superintendent of the Copper Range Co.'s mill at Freda, Michigan.

William E. Warne, of California, long identified with Western development and conservation, was sworn in as Assistant Secretary of the Interior on July 1. In his new capacity he will continue to have a prominent role in Western development, in which he has exercised leadership since his first assignment to duty with the Bureau of Reclamation in 1935.

G. M. Proudfoot, formerly assistant mine superintendent, Hudson Bay Mining and Smelting Co., Ltd., Flin Flon, Manitoba, has resigned to accept the position of mine superintendent of the Navio Jouni mine on the island of Cyprus for the Cyprus Mines Corporation.

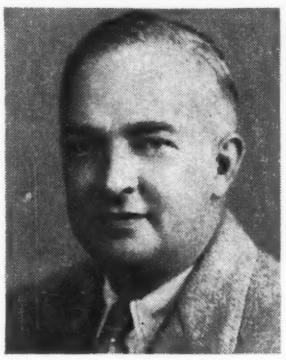
Richard W. Senger, director of technical employment and training for American Smelting and Refining Co., and formerly general superintendent at the company's smelter at Garfield, Utah, recently retired after 41 years with the company. Mr. Senger plans to travel and will make Salt Lake City his headquarters.



RICHARD W. SENGER

A. L. Blomfield was chosen president at the annual meeting of the Ontario Mining Association. L. K. Brindley became first vice president and R. L. Healey, second vice president. Directors were elected as follows: R. E. Barrett, R. A. Bryce, R. L. Beattie, L. K. Brindley, A. L. Blomfield, E. G. Crayston, R. E. Dye, R. L. Healey, Oliver Hall, J. M. Kilpatrick, E. L. Longmore, E. V. Neelands, B. Neilly, W. S. Row, W. Samuel.

Samuel H. Williston, who has been identified with Sun Oil Co. since 1922, has been elected vice president and general manager of the Sperry-Sun Well Surveying Company, a wholly-



S. H. WILLISTON

owned Sun subsidiary. He succeeds **G. L. Kothny,** who died May 28. Mr. Williston will continue as vice president and a director of the Cordero Mining Co., also a Sun subsidiary, which has mercury mining operations in Oregon, Nevada and California.

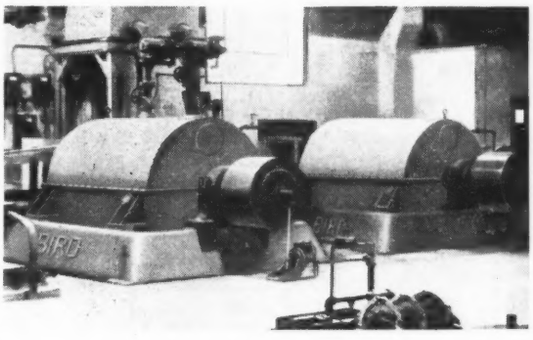
William G. Wahl, who received a Ph.D. degree in geology from McGill University on May 28, is now chief of a geological field party in the vicinity of Mistassini, about 500 miles north of Quebec, under the sponsorship of the Quebec Department of Mines. On completion of this work he will assume an assignment of professor of geology at McAllison University, Sackville, New Brunswick. Mr. Wahl is the son of **R. Lesslie Wahl,** retired, formerly general superintendent of mines for the Inland Steel Co.

Robert E. Crockett, recently associated with H. A. Brassert & Co., is now engaged in private practice as a mining engineer and general consultant, specializing in the mining and beneficiation of the raw materials of the steel and affiliated industries.

Glen L. Allen, senior metallurgical engineer with the U. S. Bureau of Mines returned to Washington, D. C.

(*Continued on page* 120)

WANT TO GET AWAY FROM SLIME?



Two Bird Classifiers like these are saving close to 50 cents a ton of reagent cost on a desliming job. They handle nearly 500 tons a day.

The BIRD Centrifugal Classifier whisks the slimes out of your flotation feeds as neatly as you please. Slimes as fine as 2 microns are removed, without chemical dispersion. Cell capacity may be enormously increased, reagent cost slashed.

The BIRD does the job continuously, at low cost. It operates for months without a shutdown for maintenance.

Better look into it.

BIRD MACHINE COMPANY
South Walpole, Massachusetts

The BIRD Centrifugal CLASSIFIER

late in June, after 17 months in Japan, where he was consultant in the Natural Resources Section of General Headquarters, Supreme Commander for the Allied Powers. Mr. Allen was engaged in investigating and reporting on the Japanese light metals industry.

A. Norman Into has been appointed general manager of the International Minerals & Chemical Corporation's Potash Division. Mr. Into joined the company in 1942 and since then has served as sales manager for this division.

Reno H. Sales, and **Senator Zales N. Ecton** (U. S.) were recently elected directors of the Research Foundation at Montana State College at Bozeman. The Foundation was recently incorporated to encourage research, to distribute information in research, to accept gifts for research projects, and to hold patent rights growing out of research.

Louis Ware, president of International Minerals & Chemical Corporation, sailed from New York for Stockholm on July 5 to confer with leading users of phosphate rock in eight European countries with a view to extending the export market for phosphate.

Henry St. Leger has been appointed the first general secretary of the International Organization for Standardization. He was formerly director of the Paris Branch, Office of the U. S. Chief Counsel for the Axis trials at Nürnberg.

J. Dahlberg has arrived in Australia to carry out geophysical surveys on areas held by the Zinc Corporation Ltd. and associated companies.

Demetrio Andres, recently appointed Director of Mines in the Philippine Government, has been in charge of the administration and disposition of the mineral resources of the Philippines since 1924. He was the one who prepared the bill, now Com. Act. No. 136, creating the Bureau of Mines, and who practically organized that office. It was also he who prepared the bill which became Com. Act. No. 137, otherwise known as the "Mining Act." Director Andres is a mining engineer and surveyor, as well as a lawyer, callings which cover all the activities of the Bureau. He is 58 years old. From 1911 to 1933, he was connected with the Bureau of Lands in various capacities. Starting as apprentice surveyor he eventually became Chief of the Mineral Lands Administration Division. When the new Division of Mineral Resources was organized in 1933 under the Department of Agriculture and Commerce, Mr. Andres was made Second Assistant Chief. In 1936, when the Bureau of Mines was created, Mr. Andres was appointed Chief of the Mineral Lands Administration and Survey Division and designated Assistant to the Director. Soon after the liberation of the Islands from the Japanese, he was asked to reorganize the Bureau and was appointed its Officer-in-Charge. From June 1, 1945 to his appointment as Director, the duties which he had been discharging were the same as those of the Director of Mines. Mr. Andres has also been a

DEMETRIO ANDRES

member of the board of examiners for surveyors, lecturer on mining laws in the University of the Philippines, and instructor on mining laws and surveying in the Mapua Institute of Technology.

D. L. Pitt has been elected managing director of Silbak Premier Mines, Ltd., following the resignation of the representatives of Premier Gold Mining Co., Ltd. and American Smelting and Refining Co. from the board of directors. Mr. Banks has been replaced by Lord Gifford, of London, England. Cromwell Hockley, chairman of the board of Selukwe Gold Mining and Finance Co., Ltd., and W. H. Mowat of Vancouver remain on the board.

Clarence H. Hall, operating engineer for U. S. Vanadium Corporation, sailed late in June for Panama to install a mill at a developed gold property.

NESTORIO N. LIM

Nestorio N. Lim, long with the Philippine Bureau of Mines, has been made chief of the Bureau's Mining and Metallurgical Division by **Demetrio Andres**, newly appointed Director of Mines.

T. Keith Glennan, 41, now an executive of Ansco Division of General Aniline & Film Corporation, and wartime director of the U. S. Navy Underwater Sound Laboratory, was named president of Case Institute of Technology, at meeting of the Board of Trustees of which he is chairman. Mr. Glennan will be the first business executive to head the Cleveland engineering school, which has had but three presidents since its establishment 67 years ago as Case School of Applied Science and which adopted its new name on July 1. He succeeds **Dr. William E. Wickenden** who will retire on Sept. 1.

Hugh J. Fraser, vice president of the International Nickel Co., Inc., has been placed in general charge of all plant operations of the company in the United States. **John A. Marsh**, assistant general manager of the Huntington (West Virginia) Works, has been appointed Mr. Fraser's assistant, and in this capacity will make his office in New York. Mr. Fraser, who has been vice president since March of this year, joined the company in 1923. Mr. Marsh has been with his firm since 1928.

George J. Stanley, director, vice president, and general sales manager for Aluminum Company of America, retired as vice president and general sales manager on July 1. He will continue as a director of the company. Mr. Stanley has served his company for 42 years in both sales and engineering capacities. **Ralph V. Davies**, **Robert B. McKee**, and **Donovan Wilmot**, assistant general sales manager for the company, have been promoted to vice presidents, and Mr. Davies will also become general sales manager, succeeding Mr. Stanley on his retirement from that post. Mr. Davies joined Alcoa in 1919, Mr. McKee in 1915, and Mr. Wilmot in 1912.

A. A. Friedman, general superintendent of New Saza Mines, Ltd., Chunya, Tanganyika, returned to East Africa recently after a vacation in California.

J. R. Govett has been appointed chairman of the Burma Corporation, Ltd., London, to fill the vacancy caused by the death of **P. E. Marmion.**

Lt.-Col. S. C. Guillan has been appointed secretary of the Institute of Metals (London) and editor of its publications.

Dr. Herbert E. Wright, Jr., of Brown University, has been appointed assistant professor of geomorphology in the Department of Geology at the University of Minnesota, Minn. He will take up his new duties in September 1947.

Hubert O. DeBeck, consulting geological engineer, has been engaged by the Research Laboratory in Ceramics of the University of Texas to make an investigation of resources and pro-

duction and beneficiation methods of ceramic raw materials in the State of Texas. He is also continuing his business as a producer-dealer of ceramic raw materials and industrial minerals at Custer, S. D.

Dr. F. H. H. Calhoun, dean of the School of Chemistry and Geology at Clemson College, Clemson, S. Car., retired July 1 after having served the college for 43 years. He will be succeeded by **Dr. Howard L. Hunter,** formerly professor of chemistry.

E. F. Fitzhugh, Jr., has resigned as chief of the Minneapolis Division, Mining Branch, U. S. Bureau of Mines, to become geologist for the Republic Steel Corporation, Cleveland.

Albin D. Molohon has been appointed regional administrator of the Federal Land Management Bureau, with headquarters at Billings, Mont. Mr. Molohon, 47, was chief of the Grazing Service's Range Management Bureau until he joined the Army in 1942.

A. L. Keats, metallurgist, and **W. E. Fitzpatrick,** assistant underground manager, both of North Broken Hill, Ltd., Australia, visited Vancouver, B. C. recently during a visit to major mining operations in Canada and the United States.

Dr. B. S. Butler, dean of the department of geology at the University of Arizona, has been awarded the Penrose Medal "for outstanding original contributions to the knowledge of the geology of metallic ore deposits."

Walter F. Meckel, mill superintendent of Cia. Min. Unificada del Cerro de Potosi, of Bolivia, is in the United States on a vacation and is also making professional visits. He will be here approximately three months.

Dr. B. H. Mason, senior lecturer in geology at Canterbury University College, New Zealand, has been appointed professor of mineralogy at the University of Indiana. Dr. Mason is a graduate of Canterbury University.

L. R. Meyers, a recent graduate of Michigan State College, is now with the geological department of Pickands, Mather & Co. on the Menominee iron range, Michigan.

F. S. Stevens, assistant chief engineer, and **J. R. Adam,** mine engineer of North Broken Hill Ltd., in Australia, are visiting South Africa to study methods of deep mine ventilation.

R. R. McNaughton and **E. M. Stiles** of the Consolidated Mining & Smelting Company of Canada, Ltd., are in Australia inspecting mining and metallurgical centers.

P. N. Pitcher has been appointed mine manager of Utica Mines (1937), Ltd., in British Columbia. He formerly held a similar position with the Cariboo Gold Quartz Mining Co., Ltd.

Harry Townsend, of Seattle, and **M. F. Thompson,** of Salt Lake City, made

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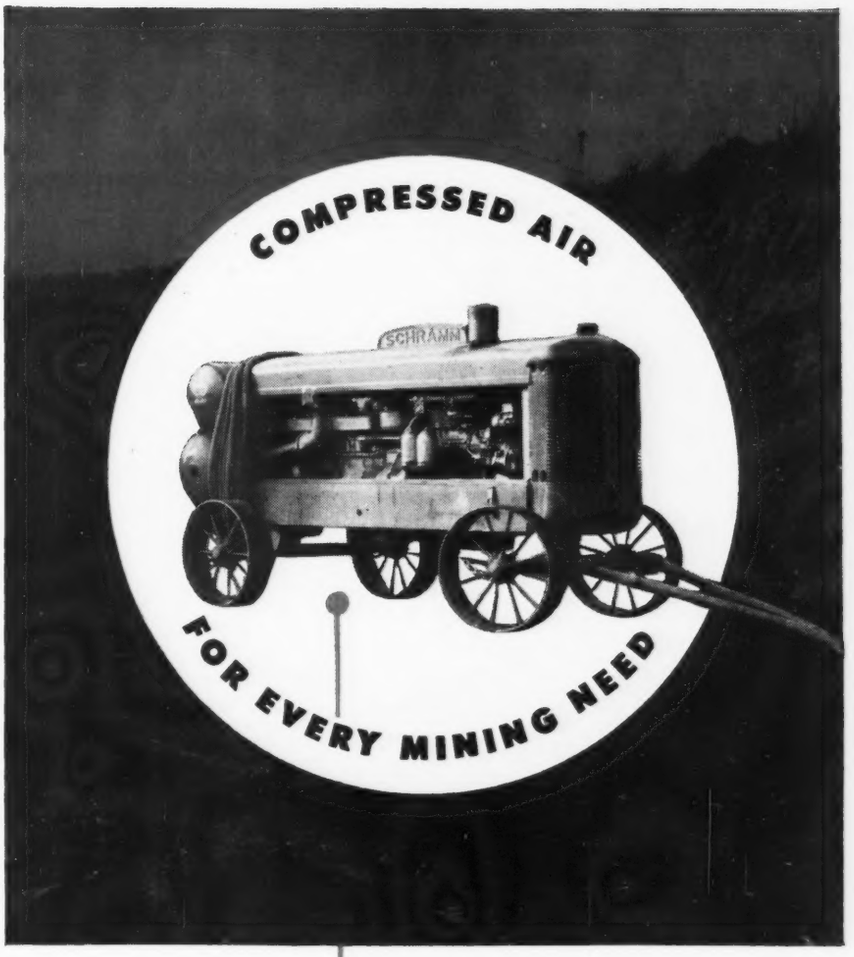

Here is another mining job calling for a Schramm Air Compressor . . . one of many uses for Schramm in the mining industry!

Schramm Compressors are called the "versatile" Compressors because they do *so many jobs* around the mine, *simplifying your demands for air where you want it!*

Users of Schramm Air Compressors list these features as outstanding: (1) 100% watercooled (2) mechanical intake valve operating from cam in perfect timing (3) forced feed lubrication (4) larger discharge valve with lower lift adding to efficiency.

Too, there's a push-button to allow instant starting. Every Compressor is compact, lightweight, easy to move about on the job.

For full construction details, write today for your copy of bulletin COM-45.

SCHRAMM INC.

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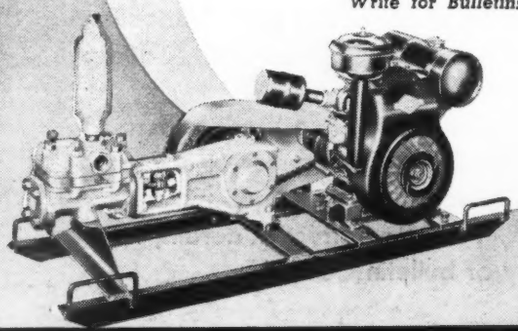

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examinations of British Columbia mining properties last month on behalf of Anaconda Copper Mining Co. They had been preceded in the field by **V. D. Perry** and **A. M. McDonald**, other company engineers.

Albert Hermon Case, vice president and consulting engineer of Tennessee Corporation, was awarded the University Medal for Excellence by Columbia University on June 3. This medal is presented annually to an alumnus for public service. Mr. Case graduated from Columbia University as Engineer of Mines in 1905. This event marks the second time in two years that Mr. Case had received scholastic recognition. In 1945 he was the recipient of an honorary degree of Doctor of Engineering from Michigan State College, from which he graduated in 1902, for exploratory and development work done in North, South and Central America. Mr. Case first became associated with the Lewisohn interests in 1907 in San Pedro, N. M. In 1910 he became general manager of Tennessee Copper Co., Copperhill, Tenn. and from 1913 to 1919 was also connected with South American Gold & Platinum Co. From 1919 to 1923 he supervised the design and erection of large fertilizer plants for Tennessee Corporation at Atlanta, Georgia, and Lockland, Ohio. He is a trustee of Tampa University and a member of the Bankers Club of New York and the University Club of Tampa.

Ewart G. Langille is making a geological study of the Portland Canal properties of Gold Drop Mines, Ltd. He was recently mine manager of Big Four Silver Mines Ltd,

OBITUARIES

Percy E. Marmion, 68, chairman and joint managing director of the Burma Corporation, Ltd., London, died suddenly on June 10. Mr. Marmion was born in Australia and graduated from the Ballarat School of Mines. He was a director of North Kalgurli (1912), San Francisco Mines of Mexico, Gold Mines of Kalgoorlie, the Imperial Smelting Corporation, National Smelting Company, and Nonferrous Metal Products Company.

Henry Y. Eagle, 57, died June 18 at New York Hospital after an illness of two months. A graduate of Lehigh University in 1912, Mr. Eagle was with the Archer E. Wheeler Company as a consulting metallurgist for 30 years. The company built metallurgical plants in this country, Canada, the Belgian Congo, Rhodesia, Australia and Finland. Mr. Eagle was a member of the American Institute of Mining and Metallurgical Engineers, the Electrochemical Society and the Mining Club of New York.

Elisha Harris, 79, died June 3 as the result of injuries received in an auto-

(*Continued on page* 123)

mobile accident at Deming, N. M., while on a mine examination trip. Mr. Harris was well known in Mexican mining circles.

C. E. Adams, at one time well known in Arizona mining circles, died at Phoenix, on May 7.

T. H. O'Brien, vice president of the Inspiration Consolidated Copper Co., died June 25 at the age of 70 in a Los Angeles hospital.

Robert Lewis Dean, 54, of Salt Lake City, executive assistant to the president of Combined Metals Reduction Co., died of a heart attack June 27 at Pioche, Nev., where he had gone to visit the company plant. He had served previously as superintendent at Pioche, but more recently had been engaged in the Tri-State District as district superintendent for the St. Louis Smelting & Refining Co.

Thomas N. Brogan, of Butte, for many years associated with the Domestic Manganese & Development Co., Butte, died at Eureka, Calif., June 22. Mr. Brogan was a native of Granite County and an active member of the Mining Association of Montana.

Louis W. Kempf, 49, died at the home of a friend in Cleveland on June 14. Assistant director of research at the aluminum research laboratories of the Aluminum Company of America, he was nationally known as the inventor of a large number of alloys and processes used in aluminum manufacture. Active in the affairs of the American Society of Metals, the American Society for Testing Materials, the American Foundryman's Association and American Institute of Mining and Metallurgical Engineers, he was named chairman of the A.I.M.E.'s Institute of Metals division in 1946.

W. H. Leonard, chairman of the board of the Gardner-Denver Co., of Quincy, Ill., died at his home in Denver June 30, aged 74. In 1906, Mr. Leonard organized the Denver Rock Drill Manufacturing Co. which subsequently was merged with the Gardner Governor Co. when the Gardner-Denver Co. was organized.

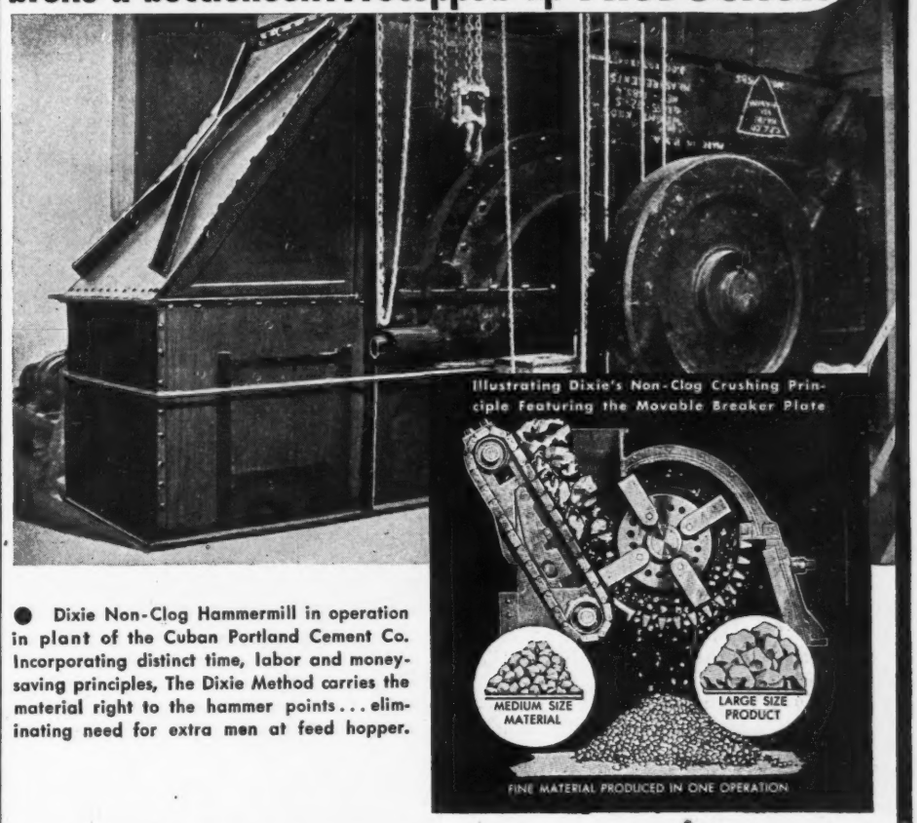
Dr. Harry Seltz, 51, professor of physical chemistry at Carnegie Institute of Technology, died June 19 at his home in Fox Chapel, Pa., after a brief illness. Dr. Seltz, an outstanding man in his field, had been a member of the Carnegie faculty for the past 23 years.

Walter R. Crane, mining engineer, died recently in Berkeley, Calif., aged 77.

Fred J. Schuster, 59, chief clerk for United States Smelting, Refining & Mining Co., Salt Lake City, Utah, died April 21 of a heart ailment.

Oscar L. Mills, 62, well known in mining and metallurgical circles for the past 25 years, died in Los Angeles on June 10. He was a director of the Western Mining Association, and also was president of metal supply, oil tool and mining companies.

How the CUBAN PORTLAND CEMENT CO. broke a bottleneck...stepped up PRODUCTION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FINE MATERIAL PRODUCED IN ONE OPERATION

● Dixie Non-Clog Hammermill in operation in plant of the Cuban Portland Cement Co. Incorporating distinct time, labor and money-saving principles, The Dixie Method carries the material right to the hammer points... eliminating need for extra men at feed hopper.

Down in the bay of Mariel, some 20 miles out of Havana City, the semi-tropical climate accounts for 50 to 70 inches of rainfall per year. For the Cuban Portland Cement Co., this factor ... combined with the soft, wet material generally encountered in quarrying operations ... was seriously curtailing production.

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REGIONAL NEWS

TRI-STATE

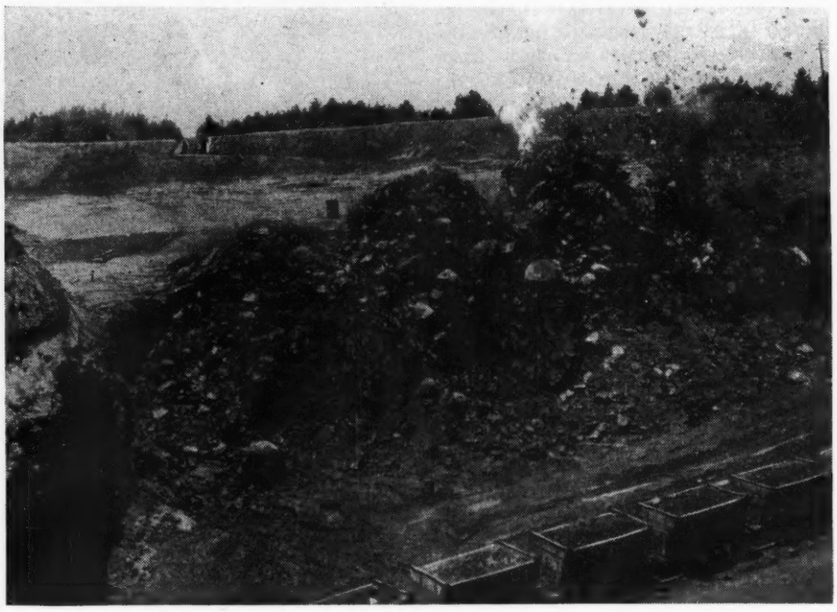
Subsidy expiration causes shut down—Eagle-Picher repairs Mullins shaft.

★ On the eve of the expiration of the Premium Price Plan for copper, lead and zinc, Tri-State ore producers awaited action by Congress on pending legislation in order to continue operations on the present scale. The St. Louis Smelting & Refining Co. discontinued its mining operations in the district June 30, and milling operations a few days later. Previously, the Eagle-Picher Mining & Smelting Co. had announced that its Paxson property would end production June 30 unless Congress by that time extends the Premium Price Plan. The company also stated that the Central mill would continue to handle all ores produced by company mines and all ores that other operators might ship to the mill. The company did not state specifically which mines would be operated, but added that as many would be operated as permitted by the open-market price of zinc. Other major companies, including Kansas Exploration, suspended operations on July 3 for the Fourth of July holiday observance, and watched developments. All tailing plant operations, producing some 700 tons of zinc concentrates weekly, were scheduled to suspend operations upon expiration of the Premium Price Plan.

Discontinuance of the plan caused production of zinc concentrates to fall to 1,210 tons by the middle of July, as compared to 5,400 tons per week under the subsidy plan. A mid-July survey showed 15 mills, of which two were tailings plants, in production. When subsidies were in effect three times that number of mills were operating.

★ Extension by agreement of the working contract between the Eagle-Picher Mining & Smelting Co. and the International Union of Mine, Mill & Smelter Workers for 21 days, to July 21, was announced with the expiration of the old contract on June 30 Howard Lee, CIO district representative, indicated that a strike among employees, approved by vote of union employees June 26, would not take place at least until after July 21.

★ Holdings of the Blue Bird Mining Co., a mile southwest of Cardin, have been acquired by the Eagle-Picher Mining & Smelting Co. The Blue Bird company held leases on the old Blue Bird and Wilson forties, and has been mining on the former lease for several years. Mine operations were suspended May 31 with the closing of the deal. Since then, Eagle-Picher has been carrying on development work at the properties.



AN OPEN-PIT BLAST at the Alcoa Mining Co. property, Bauxite, Arkansas.

LOADING BAUXITE at the Alcoa Mining Co. property, Bauxite, Arkansas.

★ Eagle-Picher Mining & Smelting Co. is recribbing and repairing the old Mullins shaft, just north of the company's Foley No. 3 shaft two miles north of Picher in Kansas. The shaft, which is about 320 ft. deep, will be reopened and sunk 75 ft. deeper, and will be used as a man-shaft and for ventilation purposes. It will connect with the workings by a raise from the Foley underground workings, which are 450 ft. deep.

★ Dewey Sims of Miami has completed a new shaft on the old Commerce Pelican lease, two miles northwest of Picher. The mine is being

opened up on the 230-ft. level. The shaft is west of the Eagle-Picher Gordon No. 3 mine.

★ Evans-Wallower Zinc, Inc., has suspended the retreatment of tailings at its No. 4 plant, east of Cardin, for the purpose of treating ore from its No. 16 mine on the old Golden Rod No. 9 lease, a half-mile southeast of the mill. Ore from the mine previously was treated on a custom basis over the Scott mill of the Scott Mining Co.

IRON COUNTRY

Bates mine suspends operations—Jones and Laughlin to open Vicar mine

★ The Bates mine near Iron River, Mich., operated by M. A. Hanna Co., suspended all mining operations the second week in June because of exhaustion of iron ore, and allowed the mine to fill with water. It was opened about 30 years ago, and produced nearly four million tons.

★ Plans have been announced by Harry Peterson, general superintendent, Jones and Laughlin Ore Co., for the immediate opening of the Vicar mine in Sec. 12, Twp 47, Range 45, two miles east of Wakefield, Mich., on the Gogebic range. Extensive exploratory drillings have been in progress on the property for over a year. A 600-ft. shaft will be sunk and about $1,000,000 spent in the next three years, giving employment to about 150 men. R. C. Comer will be superintendent.

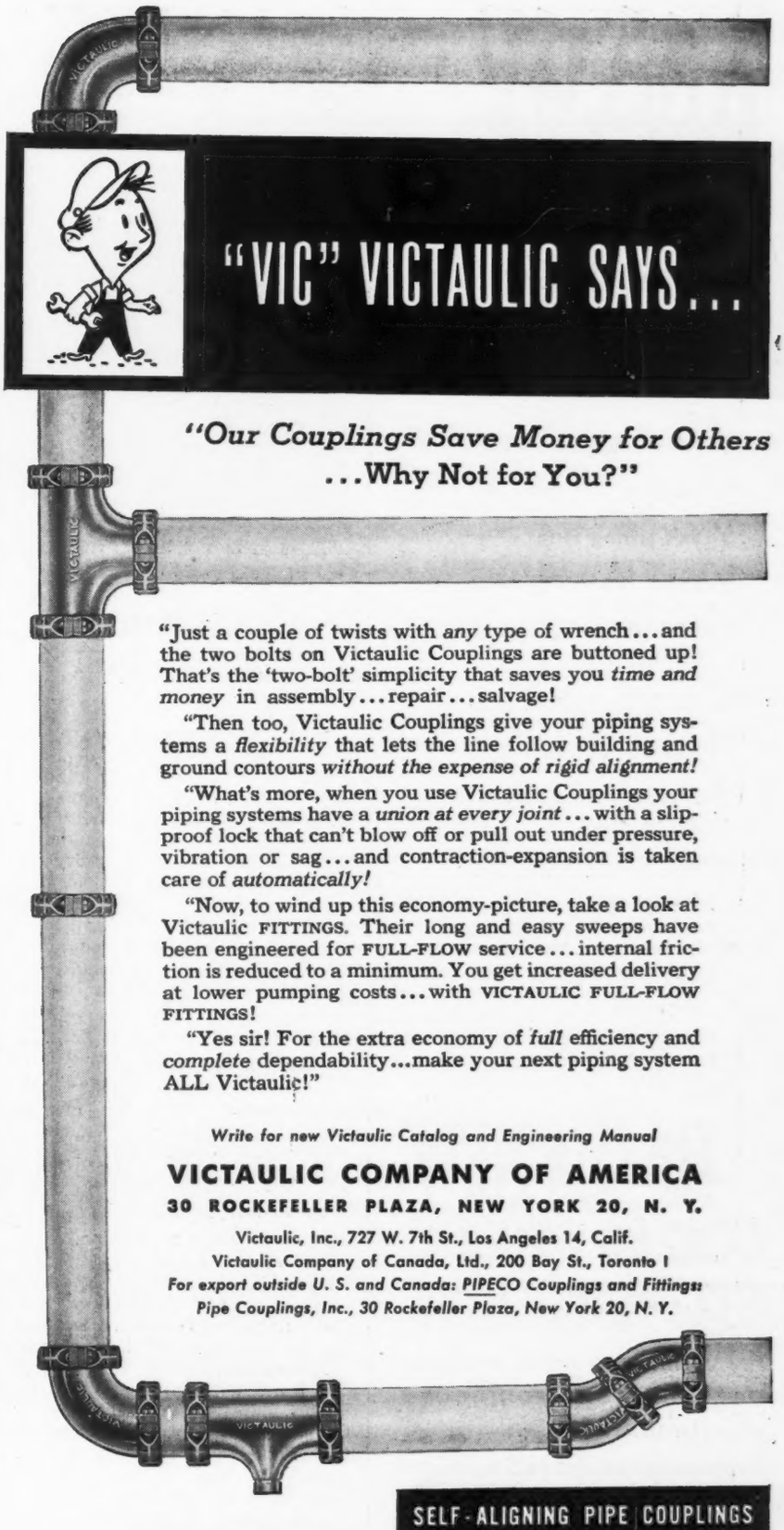
★ Progress is being made on the sinking of the new Mather "B" shaft in the city of Negaunee, Mich. It is now down more than 30 ft. into the ledge. The size is the same as the present "A" shaft. It is planned to sink to a depth of about 3,000 ft. with part of the shaft being raised through "A" shaft.

★ The Evergreen Mines Co., Crosby, Minn., has been merged into Hanna Coal & Ore Corporation, operating subsidiary for the M. A. Hanna Company's iron ore, docks, vessel, and lake coal business. For the past two years, the Evergreen company, owning a group of iron and manganiferous ore mines on the Cuyuna and Mesabi ranges, has been operated by the M. A. Hanna Co. as agent.

MICHIGAN

Calumet & Hecla employment increases—Copper Range tests White Pine ore

★ Calumet & Hecla Consolidated now has a total of 2,268 employees, an increase of more than 13% over 1946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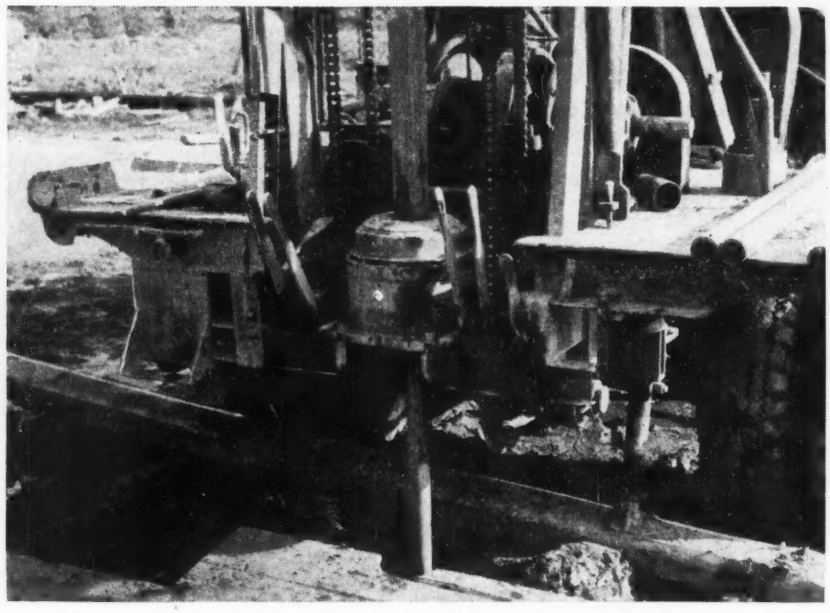
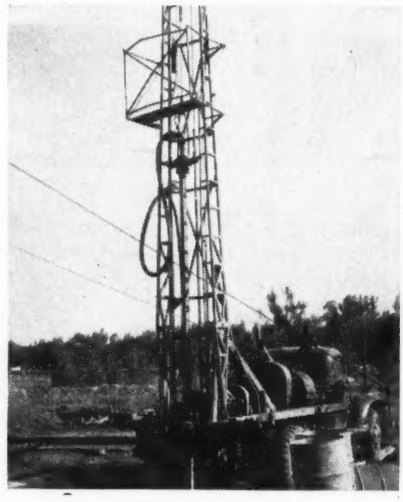


Truck-Mounted Rotary Drill



This truck-mounted rotary drill, used in drilling bauxite deposits in Arkansas, is similar to an oilfield rotary drill. Instead of a chuck, such as is used in diamond drilling, this equipment uses a square joint or "kelly", and a small rotary table. Weight control is obtained by pulling up or down on the crossbar mounted on top of the kelly. Fishtail bits are used for drilling soft formations. A small mud pit is dug, and mud is circulated as in oilfield drilling practice.

Michigan *(Continued)*

employment. Expansion of operations in the underground and smelter departments accounted for the major part of the increase. Additional underground men will be needed in the near future to meet scheduled increases in mine production.

The company now has 125 men in its secondary copper department which is producing more copper than the underground mines. Scrap copper is now plentiful in the market.

According to C. H. Benedict, chief metallurgist of Calumet & Hecla, the Metals Reserve Co.., made money on the clad scrap contract it entered into with Calumet & Hecla. The C. & H. company agreed to treat copper-clad steel scrap at a fixed price per ton, guaranteeing a certain copper return to the Government and selling for the account of the Metals Reserve the recovered fine copper and the resulting clean steel scrap. Calumet & Hecla delivered to the Metals Reserve 20,803,587 lbs. of copper and 40,048 tons of steel, which resulted in an income of $3,066,837. Against this, the raw material as purchased by Calumet & Hecla for the account of Metals Reserve cost $1,759,128, and all charges for treating this material, including the service charge of $5 per ton and the amortization charge of $4 per ton, amounted to $1,213,641. The total of these two items, $2,972,770, yielded a profit to Metals Reserve of $94,068.

★ Tests of copper rock coming from development openings at the White Pine property of the Copper Range Co. in Ontonagon County are being made in the company's mills. The results will largely determine future development plans.

MONTANA

Princeton Mining Co. to diamond drill property — Amazon Mining exposes good vein

★ Princeton Mining Co. has been organized to operate the Princeton group of claims five miles from Maxville, in

Granite County. It is reported that a contract has been let to diamond drill the veins to a depth of at least 1,000 ft. The property has been opened on the surface for a length of over 1,000 ft. and to a depth of 100 ft., exposing lead-zinc-silver ore. Officers are: J. W. Abbott, president; Tom Meisinger, vice-president. K. W. Denne, secretary and treasurer, and Francis A. Hancock, mining engineer.

★ Amazon Mining Co. is building a new road to the property which it is opening near Noxon, Sanders County. The company located several claims last November. C. W. Palmer, president, and E. A. Lunden, secretary, both of Coeur d'Alene, Idaho, reported the discovery of a new vein said to be approximately 12 ft. wide and exposed for a distance of 400 ft. Assays from surface outcrops gave returns in silver, gold, and copper totaling $12 per ton. A bulldozer is being used to strip the vein preparatory to tunnel prospecting. Other directors of the company are: P. C. Olson, Coeur d'Alene; Richard Senft, Sandpoint, Ida., and J. S. Brooks, Noxon.

COLORADO

Many properties resume work in State—Ouray properties acquired at tax sales

★ Treasure Mountain Gold Mining Co. has resumed in its Santiago tunnel near Silverton under direction of E. R. Abadie. The properties of the company include the Scotia, Golden Fleece, San Juan Queen and Sandiago mines one mile north of Silverton. Guy L. V. Emerson, Denver, is president of the company.

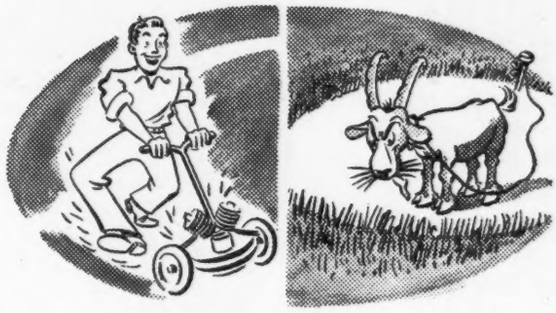
★ J. W. Collins will establish an ore testing laboratory at Alma to do custom work and handle tests for the Record mill, of which Art Flanagan is superintendent.

★ The Emperius Mining Co. at Creede is running a 100-ft. raise to connect the Commodore and Amethyst mines. Production now averages 80 tons a day, and is to be increased as manpower becomes available; 65 men are now employed at the mine and mill.

★ The new 50-ton mill under construction by the Federal Mining Co. in Russell Gulch is expected to start operation this summer. The 400-ft. shaft has been put in condition, and present development is confined to drifting and raising on the bottom level. When the mill is turned over, sufficient ore for steady mill feed will be blocked out, says J. H. Thouvenell, Denver, president and general manager.

★ To obtain favorable prices for uranium and vanadium ores, independent producers and miners of western Colorado and southern Utah are perfecting an organization which it is believed will represent at least 90% of those owning claims and engaged

STEEL *IS* CHEAP!



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Obviously, the average increase in the price of steel affects the cost of living very little.

*Iron Age's composite price is a weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strip representing 78% of U. S. output.

Fabricated steel products such as grinding media, bolts, nuts, rivets, steel joists, wire mesh, forgings, etc. which must go through many finishing processes are higher per pound than the composite price of steel.

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RENEWED INTEREST in the Ouray mining district, Colorado, is indicated by the heavy demand for tax-delinquent claims made to Ouray County commissioners. Several hundred were sold last year. Part of the Ouray district below Red Mountain Pass is shown above. Idarado mine is at lower right.

Colorado *(Continued)*

in the production of carnotite ores in that area. The organization will carry the fight for better prices to the Atomic Energy Commission in Washington.

★ A 10-man crew is employed in the Solomon tunnel of the New Ridge Mining Co. at Creede, and regular shipments of lead-silver-gold ore are being made to the Arkansas Valley smelter at Leadville and the Creede mill. Principal production is coming from the Solomon claim, but some ore also is being mined on the Mexico claim. O. B. Helmick is manager.

★ Golconda Mines, Inc., plans to operate its properties in the northwest part of Hindsdale County in the Silverton quadrangle of the San Juan Mountains. The property consists of about 1,200 acres. On the Golconda vein 5,411 ft. of development work has been done. It is reported that three orebodies with gold-silver values were found with good concentrating values in the form of lead, zinc and copper. W. F. Moenke is engineer, and company offices are in Denver.

★ Demand for mining claims in the San Juan area has become heavy as evidenced by applications to the Ouray County commissioners. In action taken by the commissioners under a recent State statute, Ouray County became the owner of all claims where taxes had been delinquent for eight years or more. The County thus acquired hundreds of claims. Several hundred were sold last year.

★ Merrill E. Shoup, president of Golden Cycle Corporation, says there have been revivals of reports that higher prices for gold can be expected before the end of the year. Such rumors prevailed in 1933 before gold was advanced, he said. Mr. Shoup said statistics prepared for the industry show that all the gold mined in this country could be moved at $60 an ounce if a free market for gold prevailed.

★ A crew of 15 men is employed at the Ute Mining Corporation's mine, formerly the Red Arrow, 11 miles east of Mancos. Fred Brinker is president and manager. The property is leased from the Red Arrow Gold Corporation of Mancos. The mine is developed by crosscuts, drifts, and raises. All present work is conducted through the No. 2 or mill level. Stoping was carried on during 1946 at a point about 1,000 ft. from the portal and about 100 ft. above this level. Most of the ore milled this year was sorted from No. 2 level dump.

★ Members of the U. S. House of Representatives Small Business Committee met in Denver recently to hear pleas from mining men for help in formulating legislation benefiting small mines.

★ A 10-lb. turquoise nugget, believed to be the largest of its kind in the world, was recently discovered by Wallace King in the King Turquoise mine near Manassa in Conejos County.

★ Walter Scott Jr., mining engineer of Central City, and Harvey Tedrow, manager of El Paso Mines at Cripple Creek, have taken a long term lease on the Mendota mine at Silver Plume. The Mendota joins the Terrible-Dunderberg property, already held by the two men, and the consolidation gives them control of several thousand feet along the strike of three productive veins.

★ Work is in progress again at the Golden West mine near Dumont where a promising streak of ore is being opened up. B. L. Groth and J. A. Ludwig, both of Denver, are working the mine on a partnership basis.

★ Gold receipts in May at the U. S. mint in Denver approximated 48,416 oz. with a value of $1,694,546, compared with approximately 35,987 oz. worth $1,228,067 in May, 1946. Silver receipts totaled 11,233 oz. worth $10,007, compared with 5,105 oz. valued at $3,623 in May, 1946.

★ Urpo Kyto of Duluth, Minn., president, and L. E. Stein, director, of the Silver Shield Mining Co., of Salt Lake City, have been at Ouray recently, making final plans for erecting their 250-ton mill and putting on an extensive development campaign on the 30 claims they have purchased from Geo. Mulvey. These include the Terrible Queen, the Humboldt Leasing Co., the Humboldt Mines groups and outlying Mulvey properties. Mr. Kyto also purchased the entire Wanaka group of claims for the Silver Shield Co. from the county. The mill at Hawthorne, Nev., is now almost completely dismantled, and will be shipped to Ouray.

★ John G. Welch and J. R. McDaniels set up a dragline outfit about one-fourth mile above the Swan River near Breckenridge.

★ The Little Ida mine, which produced lead and zinc ore early in the century, is being reopened at Silverton. Ray Barnes of Silverton is installing a new compressor, and repairing the road from Animas Forks to California Gulch, where the mine is situated. He hopes to start production soon. Fred Brinker is the owner.

★ The Rittenhouse property, on Gold Hill at Cripple Creek, has been opened by the Troy Wade Leasing Co. The property is now under the name of the Dooley Leasing Co., which is a subsidiary of the MacMillan Petroleum Co., Wade stated. The Wade lease is formed by Troy Wade, Ben Hill, Leo Zitnik and John Bickerstaff. Wade stated that the mine is fully equipped. The shaft is 700 ft. deep and is in excellent condition. Work will start on the 300-ft. level and then extend to the 400-ft. level.

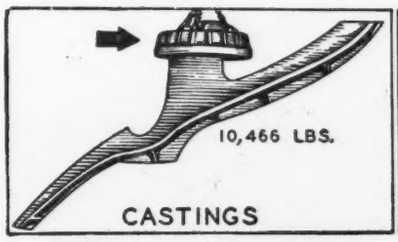
★ Harrison Smith, Cripple Creek, is getting the Pinto mine on Bull Hill ready for operation. The Pinto mine is on the Free Coinage property and is owned by the Arcadia company.

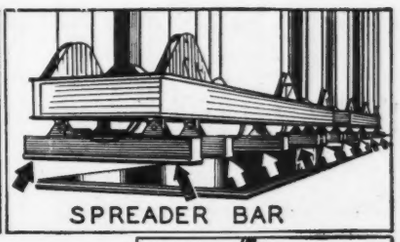
ARIZONA

Miami Copper plans premium tax litigation—Activities increase in Cochise County

★ Officials of the Miami Copper Co. and its subsidiary, the Castle Dome Mining Co., informally advised the Arizona State Tax Commission that they are planning litigation to determine, through the courts, whether metal premium payments paid to mines by the Federal Government are taxable under the State sales tax law.

The first step in the procedure, the





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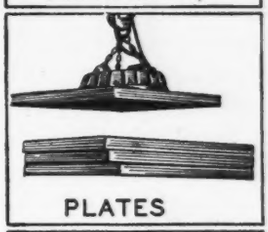
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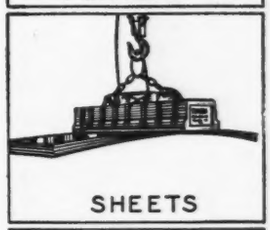
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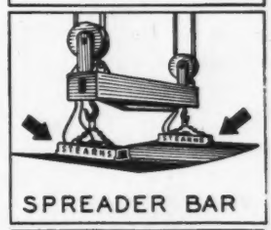
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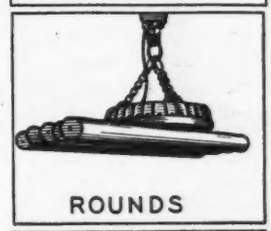
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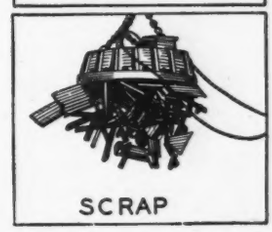
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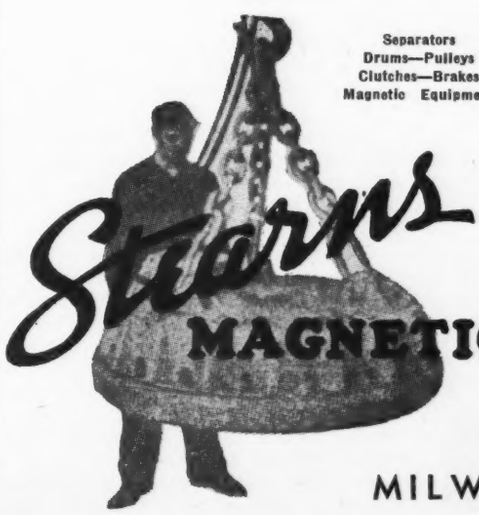

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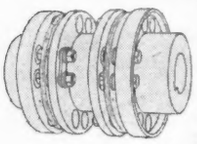

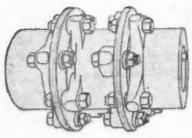

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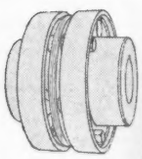

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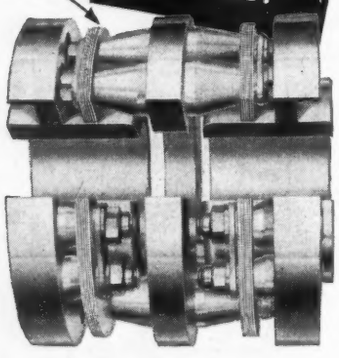

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Arizona *(Continued)*

tax commission was informed, will be for the two mining companies to pay the back taxes on Federal subsidy payments which are claimed by the State. On June 20 the companies requested a decrease in 1947 assessments. They claimed that orebodies on the two properties are rapidly being depleted. As further justification for the valuation decrease, company officials said that the Castle Dome orebody has an estimated life of only three years more, and that of the Miami property is only seven years more. The 1946 assessment on the Miami mine was $5,614,988. That on the Castle Dome property is $1,196,544. Commission figures show that the Castle Dome properties last year earned a net of $1,344,000. Thad Moore, tax commissioner, said if the Miami Copper Co. continued to produce copper this year on the same basis as in 1946, the net earnings will approximate $5,000,000.

The mining companies are planning the test case as the result of a recent holding by the majority of the commissioners that Federal subsidy payments to the mines which were initiated in 1942 for the purpose of stimulating metal production—particularly copper—are subject to the sales tax levy.

The commission a year ago, accepting the opinion from the Attorney General's office, said that these premium payments were not taxable.

Recently, in view of the supreme court decisions in other states holding to the contrary, the commission reopened the issue and two commissioners voted to order the mines of the State to pay approximately $358,000 in back taxes on the Federal subsidy payments. It was estimated that the Miami and Castle Dome companies would be liable for the back taxes totaling $125,000.

On June 23 the tax commission received a request from the American Smelting & Refining Co., which operates a mine in the Patagonia district, for a hearing on a commission order assessing that property with $8,756 in back taxes on Federal subsidy payments.

★ The 450-foot smokestack of the abandoned United Verde Extension Mining Co. at Clemenceau, was demolished June 22 at the company's old smelter. It was one of the nation's largest. Destruction of the giant stack was planned to provide additional space for the Cottonwood Airport expansion and to eliminate the landmark as a flying hazard.

★ As a part of its expansion program, the Phelps Dodge Corporation, Ajo, Arizona, is undertaking a $457,000 building project in that district. The project will include residences and community buildings. The construction program calls for 50 new houses, a $150,000 locker building for its 1,250 employees, and a recreation center with a 650-seat theater and library.

★ Mining activities are increasing in Cochise County. Numerous lode locations and some placer location claims have been filed. Old claims are being transferred or reworked, and new mining companies are active in the district. A 100-ton mill has been erected in Tombstone to process lead and zinc. Mining men hope to resume work in the mineralized areas of the Fort Huachuca reservation where military installations are being inactivated.

★ Small miners of Arizona are protesting the recent suggestion of the Arizona State Tax Commission that sales taxes be retroactively assessed on all premiums paid by the U. S. Government during the war.

★ The Big Six gold mine in Cave Creek, about 50 miles north of Phoenix will be opened soon under the supervision of A. W. Smith. Access roads are under construction.

★ Operations at Cunningham Pass, north of Yuma, are being planned by W. B. Harris, president of the Centroid Mining Co. The property was idle during the war.

★ Twenty-eight mining claims in the White Mesa mineral area near Globe have been acquired by the Lewin-Mathes Co. of St. Louis, Mo. Extensive drilling is being done at the property. Present plans also call for the erection of a $500,000 processing plant. The copper deposits at the property will be operated by open-pit methods.

★ The Cedar Talisman Consolidated Mines, operators of the French Lilly in Yavapai County, has made two shipments of lead to the smelters in El Paso. Improvements in progress include the retimbering of a 400-ft. shaft and the construction of a 65-ton flotation plant.

★ The Phelps Dodge Corporation has started reconditioning of the old Shattuck Denn Mining property. According to present plans, all copper ore from this section of Phelps Dodge holdings will be hoisted through the Denn shaft, while the nearby Cambell shaft will be used for the hoisting of lead production.

★ The Arizona Department of Mineral Resources has been granted appropriation of $33,250 by the State Legislature. Increased attention will be given the field of non-metallics, and the compilation of statistical records will be improved. Charles H. Dunning is director of the department.

★ W. S. Samson, Douglas, has resumed work at the El Tigre mine, in Cochise County, and is shipping lead-silver ores.

★ P. L. Bones is directing development work at the State of Texas mine in the Hartford mining district. A prospect shaft is said to be proving ore carrying values in zinc, lead, copper, gold, and silver. The property is owned by Grace M. Sparkes and associates of Bisbee.

★ Robert Thorsten, Chloride, and his brothers are developing the Granite Butte mine, three and one-half miles south of Mineral Park. They expect to start shipping at an early date. The ore, carrying values in lead, zinc, silver, and gold, will go to the Keystone mill of the Mineral Park Milling Co.

★ John T. Atchison and William Rossman are shipping mica from the Sunshine Mica property, 12 miles west of Ajo, which they hold under lease and option.

★ General Asbestos of Arizona, Inc., of Los Angeles, Calif., has purchased the asbestos properties of Roger Kyle, near Young, Ariz. and operations have been resumed. Ore is mined by underground and open-pit work, and the product will be fiberized at the asbestos plant at Globe, also purchased by the company. Henry Mul-

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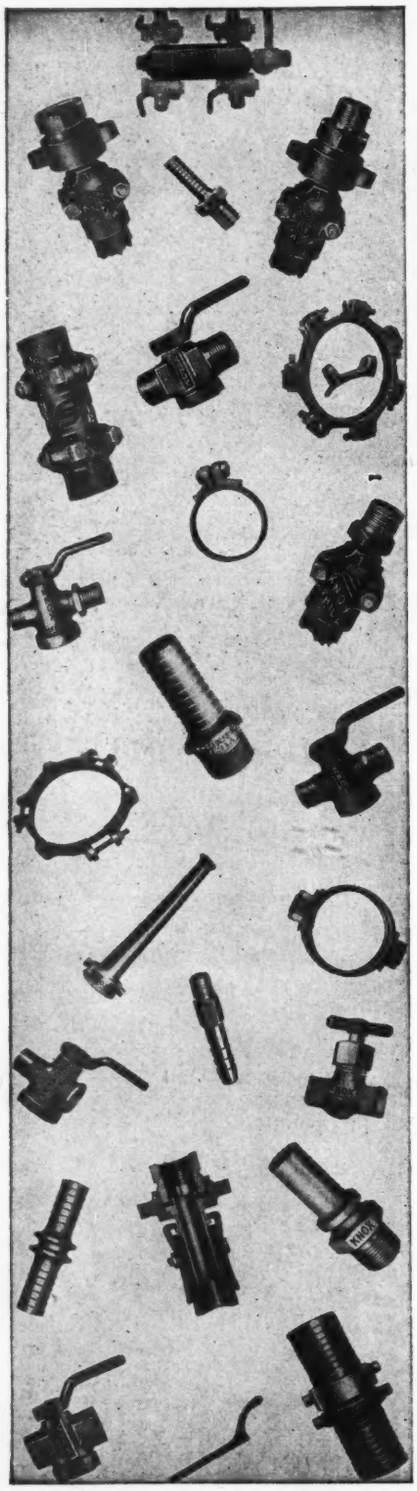

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Arizona *(Continued)*

ryan, consulting engineer and geologist, is directing the new program, and George Kohl is mine superintendent.

★ Weaver Placer Mines, Inc., has purchased the Merrill placers in the Weaver district of Yavapai County and is making plans for immediate operations. J. Carlton Bray, secretary of Weaver Placers, has established offices at Phoenix.

★ A group of claims in the Turquoise district of Cochise County near Gleeson has been purchased by Neil Stewart of Douglas, and the Empire Copper Corporation formed to operate them. The claims adjoin the Tejon mine, now being diamond-drilled by American Smelting & Refining Co., and include the Empire, Charleston, Durrand, Copper Belle, Elizabeth, Dandy, Oak Grove, Katherine, and Joe claims, at one time worked by the Shannon Copper Co. but more recently owned by R. L. Brown, of Douglas.

★ Coronado Mines, Inc., with head office at Tulsa, Okla., and Arizona office at Nogales, has started development work at the Red Mountain-Buena Vista claims in the Patagonia district. Values are in copper, gold, silver, and molybdenum.

★ It is reported that work has been started on the cooling tower for the new refrigeration system for the Magma Copper Co. at Superior.

★ The Magma Copper Co. recently protested the State tax to be paid on Government subsidies for copper production. These subsidies, granted by the Government during the war, were not subject to the State's one percent sales tax.

Last month the tax commission ruled that back taxes should be paid on these subsidy payments. Sixteen firms have been ordered to pay $360,000.

Five firms have requested hearings but none has been granted thus far. Commissioner Joe Hunt indicated that the tax body would grant no relief and said that he expects a test suit to be filed in the courts. Montana courts have ruled the Government premium untaxable, while a Utah court ruling says it is taxable by the State.

NEVADA

Round Mountain to install 10,000-cu. yd. washing plant—Fad shaft at Eureka nearing 1,800 ft. depth

★ Round Mountain Gold Dredging Co., owned jointly by Gold Fields American Development Co. and Guy M. Standifer of San Francisco, will install a 10,000-cu.yd. gravel washing plant at Round Mountain, Nye County, placer deposits when necessary equipment is available. The Round Mountain Co. was said to have a long-term lease and option on all placer and lode properties of the Nevada Porphyry Gold Mines, Inc., and has reported expenditure of over $150,000 in testing and sampling the Round Mountain placers, after the Natomas Co., holding an option in prewar years, had proved an estimated 30,000,000 cu.yd. of 35¢ gravel.

★ U. S. Vanadium Corporation has constructed several new buildings at its Riley tungsten mine in the Potosi district, where David D. Baker is in charge. Three open cuts, worked by power shovel, have been supplying the near-by stockpile from which the scheelite concentrator at the Getchell mine has been drawing 400 tons per day. J. S. Wright is mine superintendent.

★ Data compiled by the State inspector of mines indicates that Nevada tungsten producers shipped concentrates containing 2,478 short tons of WO_3 during 1946. Producers include the Nevada-Massachusetts Co., Pershing County; the U. S. Vanadium Corporation's Riley Mine, Humboldt County; and Nevada Scheelite, Inc., operations at Rawhide, Mineral County, and Cherry Creek mine, in White Pine County.

★ W. H. Wagner, engineer, is directing the reopening of several formerly productive mines at Rochester. Modern equipment and methods will be used to advance tunnels and open the gold-silver zones at depth.

★ The Dog Star mine in the Hamilton district of White Pine County has been purchased by the East Standard Mining Co., Salt Lake City. The company has been shipping ore from old dumps, and is preparing to drive a 300-ft. tunnel below old mines. Phil Page is in charge.

★ At Eureka, on Ruby Hill, the four-compartment Fad shaft sunk by Ventures, Ltd., of Toronto, was reported nearing the 1,800-ft. point, with completion of a station of large dimensions at the 1,730-ft. level, where a large pump station is said to have been provided. Pumps were reported to be handling 1,000 to 1,200 gpm.

UTAH

Mining companies contest railroad switching charges — Metal mine wage negotiations continue

★ Mining and smelting company attorneys charged that there is no legal basis for the Interstate Commerce Commission ruling that railroads should add switching charges to freight fees in mine-to-smelter hauls, at a June Federal District Court hearing in Salt Lake City.

Corporation lawyers seeking to enjoin and set aside the ICC ruling contended that the ICC order finds interruption of switching movements by smelters in the process of hauling ores, while, according to the attorneys, there is no evidence in records to indicate such interruption. Any interruptions that may exist are made by the carriers in normal switching movements, they said.

Petitions to intervene filed by the Utah Public Service Commission, Colorado Public Utilities Commission, Utah Mining Association and Colorado Mining Association, held that addition of switching charges materially would affect the State's mining industries because many mines operating on a marginal basis would be forced to close.

Two separate protests were represented, one by American Smelting & Refining Co. and Bingham & Garfield Railway Co., and the other by United States Smelting, Refining & Mining Co. Cocomplainants in both protests include the Denver & Rio Grande Western Railroad Co. and Union Pacific Railroad Co., both of which opposed the ICC order.

★ Wage negotiations between Utah and Nevada metal mine operators and International Union of Mine, Mill & Smelter Workers representatives, CIO, reopened recently, still are in progress. Union representatives, negotiating now on a company-wide basis in the case of larger operations, report they have been offered an 11½¢ per hour wage increase for workers paid on a daily basis, plus five holidays with pay.

The matter of a possible return to the five-day week from the present six-day week with time-and-a-half for the sixth day is being considered.

Maurice Travis, MMSW international president, conducted a general meeting of representatives from more than 100 locals June 22 in Salt Lake City. He said the union wants 25¢ an hour increase and a health and welfare fund of 4% of the gross payroll, with the fund to be administered by the union.

Mr. Travis termed the secession issue a "dead duck." Reid Robinson, former international president who resigned to be succeeded by Mr. Travis following internal dissatisfaction, has resigned a vice presidency to enter private industry, the new president said.

★ Booth Engineers, Salt Lake City, headed by Lionel E. Booth, and its affiliate, Booth-Irani Engineers, Inc., are furnishing equipment for the first Humphreys spiral concentrator to treat rutile-ilmenite ores in the state of Travancore, India. The spiral equipment is being manufactured in Bombay.

★ A new two-story bunkhouse valued at $3,500 used by employees of Mountain Mines Co., Mineral Fork, near Park City, was destroyed by fire June 20, Charles S. Woodward, manager, reported.

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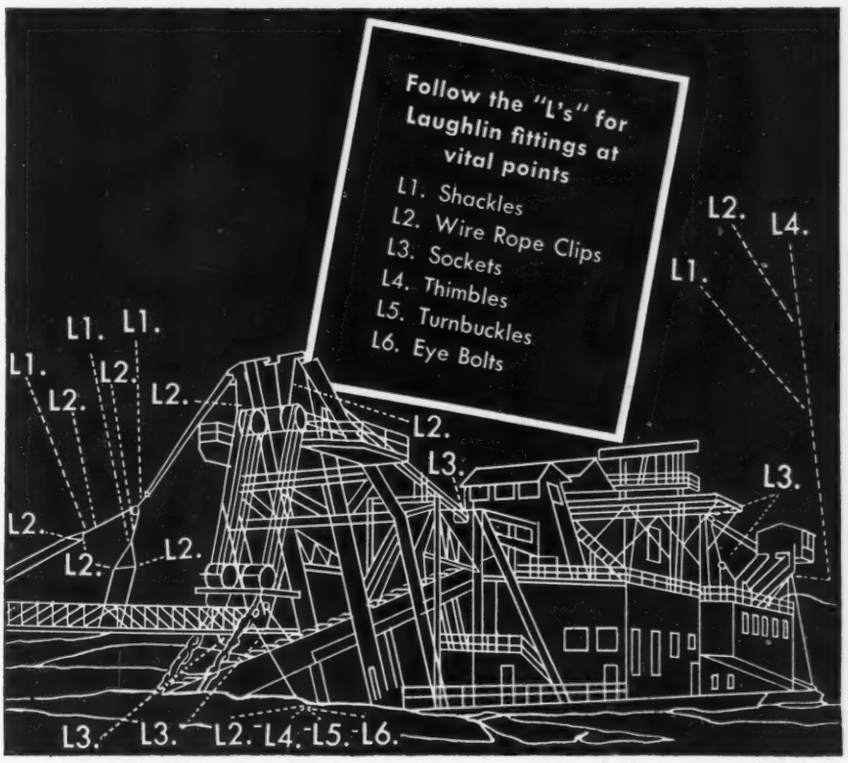

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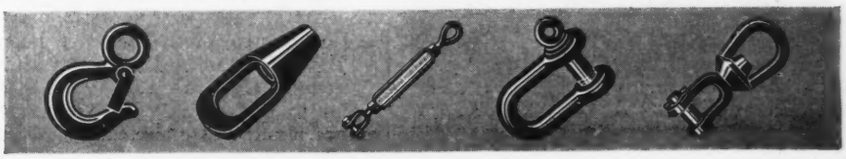

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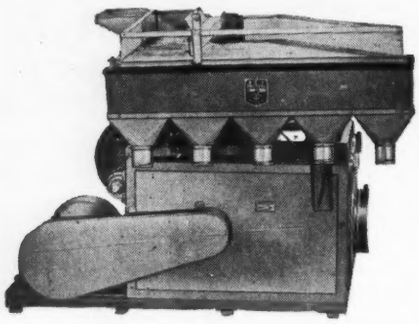

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Utah (*Continued*)

★ A large phosphate company, the name of which was not disclosed, will investigate the feasibility of establishing a phosphate mining and processing plant for peacetime use this summer, Dr. William W. Rubey, of the U. S. Geological Survey, reported recently.

He described intermountain phosphate deposits as being among the richest deposits in the world. The Paris-Bloomington area in Idaho and the Crawford Mountains of northeastern Utah are well suited for commercial development, he said, adding that an electric furnace type phosphate plant could reasonably be located in conjunction with a proposed power dam near the mouth of Palisades Creek on the Snake River in southern Idaho.

★ Utah production of iron ore during April declined to 248,394 gross tons compared with 270,495 in March, the U. S. Bureau of Mines reports.

★ Tintic Gold Mining Co., Mammoth, Utah, has let a contract to repair its main shaft to the 1,000-ft. level, preparatory to developing a lead-silver orebody discovered several years ago when the price of lead did not warrant production, E. E. Hoffman, president and general manager of the company reports.

NEW MEXICO

Peru Mining Co. shuts down—Empire Zinc Co. drilling in the Organ mining district

★ The Pumice Corporation of America, at Grants, is installing a unit that will serve as the primary crusher and washer, a large jig for concentrating the pumice ore, a vibrating screen for dewatering the final pumice product, and a concrete bin for storage of the wet pumice for surge and draining prior to drying.

★ Joseph H. Taylor, general manager of the Peru Mining Co., announced that his company would suspend operations July 1 because of the expiration of the Premium Price Plan, and other economic conditions. The company's three mines in the Silver City district, and its mill in Deming will be shut down. Several small mining operations shipping to the Peru custom mill will also have to shut down.

★ Philip Hoyt, El Paso, has recently obtained a lease on a mica property north of Santa Fe, and expects to start shipping the material to El Paso for beneficiation as soon as a favorable freight rate can be obtained.

He has also been granted a license to buy, mine, and sell ores containing fissionable elements. Although he expects to deal mainly with the more common minerals, monazite and carnotite, he suspects that there are considerable quantities of allanite in New Mexico.

★ The Molybdenum Corporation of America's mine and mill seven miles east of Questa, Taos County, continues molybdenite production under the supervision of J. B. Carman who has operated the property continually for 24 years. A log-type dryer has recently been installed for drying the molybdenite concentrates, replacing a manual drying operation.

★ The E. J. Longyear Co. is doing extensive diamond drilling in the Organ mining district for the Empire Zinc Co. With four drills in operation, a long expanse of the mineralized contact zone of the district is being explored on the Memphis, Torpedo, Franklin Group and Stephenson-Bennett properties of the Torpedo Mining Co. J. H. Brown holds the lease on the Torpedo Mining Co. holdings and is shipping from the old Stephenson dump to the El Paso smelter by truck. The area being explored by diamond drill was a large early-day producer of copper, lead and silver. Prior to this time, no complete exploration project has been carried out near the surface and no depths over 500 ft. were reached.

★ Thomas Thijo and associates expect soon to be able to open their fluorspar deposits that lie in three separate areas near Ojo Caliente in Rio Arriba County. The work done to date on the 11 fluorspar claims has proved the possible existence of extensive deposits. This district has also attracted considerable attention recently with its mica, bentonite, and fuller's earth occurrences.

OREGON

Lady Frances mine producing perlite in Wasco County

★ Pumice production during 1946 amounted to 26,614 cu. yd., and was valued at $43,649, according to the report from the State Department of Geology & Mineral Industries. The largest operation was at Chemult where a slack-line cableway with a 450-ft. sweep has been installed.

★ W. E. Pantle Gold Dredging Co. is testing ground at the town of Rogue River after having suspended operations near Jacksonville because of lack of water.

★ Chadwell and Sons have resumed operations at the McGee gold-copper mine, on East Eagle Creek.

★ Stearns and Owens have resumed operations with a 2½-yd. dragline on Applegate River, near the town of Applegate, where work was done before the war.

★ Dant & Russell, Inc., is crushing

and sizing perlite at the Lady Frances mine, in southern Wasco County, and is shipping it to the St. Helens plant, near Portland, where it is used in an accoustical plaster and in a plaster sand.

WASHINGTON

Pend Oreille Mines to sink inclined shaft — American Zinc develops Lead Hill property

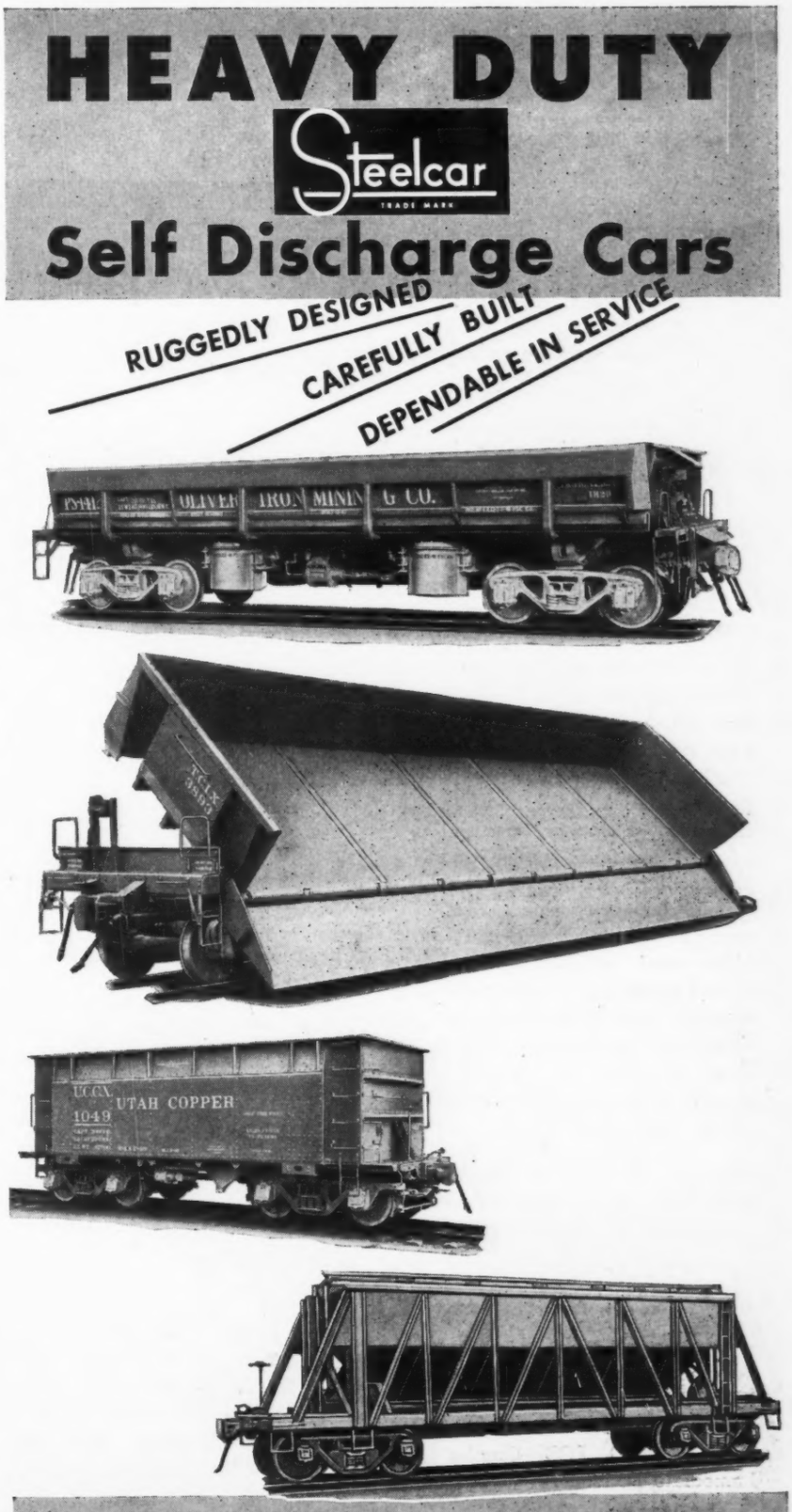
★ Pend Oreille Mines & Metals Co. produced more than 6,500,000 lb. of zinc and almost 2,000,000 lb. of lead in 1946, Lewis P. Larsen, president, announced at the annual meeting, in Spokane, June 24. Preparations are being made to sink the first 1,000-ft. section of an inclined shaft which will eventually allow mining of a substantial new orebody at several levels. The company has also advanced $100,000 to the Reeves-Macdonald mine where work was begun in April in order to hasten production at that property. According to the annual report, operating profit for the year was $214,210 before depletion, depreciation and Federal income taxes. Development during the past year included 5,545 ft. diamond drilling, 1,121 ft. churn drilling, and 3,525 ft. of drifts and raises.

★ Metaline Mining & Leasing Co. reelected H. Louis Schermerhorn president at its annual meeting in Spokane in June. James L. Leonard, of Spokane, was elected vice-president. He replaces E. K. Barnes who was chosen secretary-treasurer. J. H. Roberts and Fred Wolf are directors. Amrican Zinc, Lead & Smelting Co. which operates the mine under contract has an average production of 175 tons of zinc-lead ore per day.

★ Frisco-Standard mine, in Stevens County, is being developed by driving a raise from the 300 ft. tunnel. Lawrence Van Dyke and R. J. Graham have been at work with the crew.

★ The West Coast Mineral Association, of Seattle, has protested the Army engineers' proposed construction of a dam on the Pend Oreille River just below the Canadian border. The U. S. Bureau of Mines and Geological Survey estimate that about six billion dollars worth of lead-zinc ore reserves lie in the Metaline mining district. It is felt that drill holes and some mine portals would be flooded, some outcrops would be completely submerged, and seepage into several mines now operating would occur if the dam were constructed.

★ According to William Gans, secretary of Black Warrior Mining Co., operations have started at its lead-zinc property in the horseshoe basin, at the head of Lake Chelan. Equipment purchased from Royal Development Co. is to be moved to the prop-



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Washington *(Continued)*

erty near Lake Chelan soon.

★ American Zinc, Lead & Smelting Co. has started intensive developments on the Lead Hill property situated several miles up Slate Creek from the property of Charles Bostrom, in the Metaline area. Jess Havlik, of Spokane, has a contract for "several thousand feet of drilling" at the property.

★ The Supreme Court, after four hearings in the case of the State versus Northwest Magnesite Co., of Chewelah, made a decision by a 3 to 6 vote, on June 7. According to John T. Raftis, council for the Magnesite company, the result in large measure favored the company which has resisted efforts of the State to collect added royalties on magnesite ore taken from the State-owned quarry, known as Moss quarry. The quarry was leased in 1917 and later this lease was acquired by the Northwest Magnesite Co. The lease provided that the company should pay the State 4% of the sales of magnesite, less costs of transportation and treatment. The case was fought on what was the real sales price of the product and what constituted "treatment" of magnesite. The claim of the State for about $30,000 in interest and for costs of the case was denied by the court.

★ Public hearing on the proposed new safety code, scheduled for July 23, has been deferred to Sept. 9, when each article will be examined thoroughly at the county court house in Spokane after mining leaders and union officials have had time to study the code, according to F. G. Crowder, of Spokane, inspector of metal mines for the Washington Department of Labor and Industries. According to Dan Adair, Superintendent of Mine Safety, the committee which completely revised the safety regulations and made the final draft, in Spokane, on June 23, represented about 80% of Washington's metal mining industry.

★ Mine leaders met with B. Carroll Reece, Republican national chairman, in Spokane, June 18, to assure him that the United States is not a "have not" nation in mineral resources. Many voiced opposition to the SEC. Jens Jensen, manager of Pend Oreille Mines & Metals Co., told Reece that the mining industry finds itself competing with the Government for manpower because of the Government's tendency to raise wage rates on Columbia Basin projects, thereby enticing miners from the mines. D. I. Hayes, western manager for the American Zinc company, said the manpower shortage is preventing capacity production of lead and zinc in the Metaline area. Others suggested relief from heavy taxes, and exemption for the first three years of operating.

★ Alwyn H. Wild, of New York, president of American Chrome & Magnesium Industries, Inc., planned to be in Spokane during July to spend some

time in negotiations with WAA for operations of a pilot plant at the magnesium plant at Mead. Mr. Wild's company has been given permission by the real property review board of WAA to operate a pilot plant at Mead for six months, with a six-month extension if necessary to prove the economic feasibility of extracting magnesium metal from olivine deposits in the Twin Sisters area of Skagit and Whatcom counties. The Hansgirg process is to be used together with low-cost Bonneville power.

★ If Washington corporations file affidavits of no production before July 1, they can limit their annual license fees to $10, Wellman A. Clark told the Chamber of Commerce Mining Bureau in June. After a mine starts producing, it pays the same fee as any other corporation, according to Ray J. Yeoman, assistant secretary of state. This new law which is designed to encourage development also permits reinstatement of mining corporations which have been dissolved for failure to pay the annual license fees. By paying $10 for each year delinquent, plus the current annual $10 license fee, they may be reinstated within a 20-year period, according to Yeoman.

★ Sunshine Mining Co.'s exploration department has opened offices in the Peyton Building, in Spokane, with Rowland King, field engineer, in charge. Ross D. Leisk, Sunshine's general manager, at Kellogg, Idaho, will have general supervision of the department.

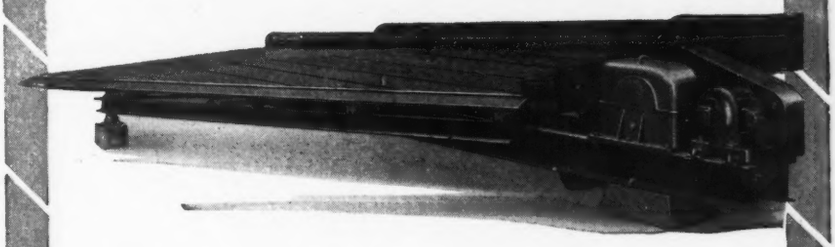
IDAHO

Silver Summit strikes ore at depth —Livingston mine is reopened in Bayhorse mining district

★ First definite results of the deep shaft development program now under way in the Coeur d'Alene mining district has been realized by the Polaris Mining Co. at the bottom of the 3,000-ft. Silver Summit shaft, where a crosscut encountered a rich silver-copper vein 950 ft. south of the shaft. The ore is a mixture of chalcopyrite and tetrahedrite, and average assays show values of 33 oz. silver and 5% copper over a width of 5 ft. The fissure is the Silver Summit vein, which was prospected by the Silver Summit company down to a depth of 1,500 ft. without showing pay ore in quantity. The Polaris company owns control of the Silver Summit company, but is not exploring further on this new discovery until the south crosscut is completed to the Chester and Yakima-Shoshone veins, some 1,000 feet further south. This crosscut is being pushed at the rate of about 18 ft. per day.

★ The Coeur d'Alene Mines Corporation reports earnings of $16,241.12 for the first four months this year.

MAXIMUM EFFICIENCY from SuperDuty Diagonal-Deck CONCENTRATING TABLES



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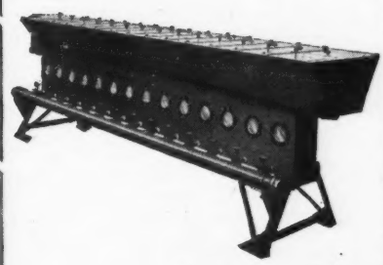

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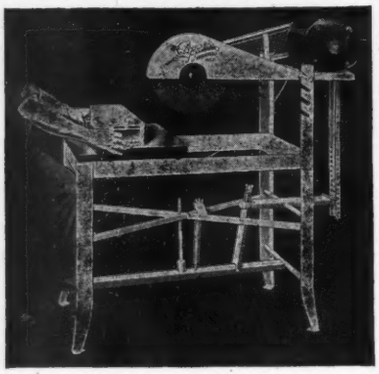

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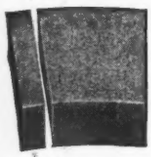

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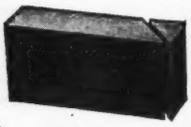

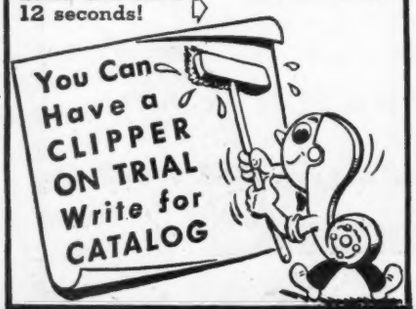

CLIPPER MFG. COMPANY
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Idaho *(Continued)*

The company reports about one year's supply of ore blocked out between the 1,800 and 2,200 levels, but production from this source is held up because of manpower shortage and incompleted connecting raise work. The company's crosscut on the 2,800 level is proceeding on into American Silver ground.

★ The Silver Cable mine, east of Mullan, is now under lease to local miners, who are mining small shoots of ore left by the Hecla Mining Co. which operated the mine under lease for a period of three years.

★ The Snowstorm Silver-Lead Mines Co., recently organized, is cleaning out and retimbering the No. 4 tunnel preparatory to prospecting for a silver-lead vein which the old-company is known to have cut but never prospected. The old workings are filled with water up to No. 3 tunnel.

★ Three Coeur d'Alene district mining companies controlled by the Day interests, the Tamarack & Custer, Dayrock and Sherman Lead, have declared their first dividend for 1947, totaling $167,180, all of which are payable June 30 to stock of record June 21. Tamarack & Custer paid $50,000 at the rate of one cent per share; Dayrock paid 2½ c. totaling $43,680; and Sherman paid $73,500, or 2 c. a share.

★ Phosphate deposits near Montpelier are being developed by the San Francisco Chemical Co., which ranks as the largest phosphate producing company of the west. The production from this company's Waterloo mine, according to D. L. King, resident manager, is 60,000 tons of phosphate per month. The Montpelier deposit was partially developed for the Government during the last war by the Homestake Mining Co.

★ The Livingston Mines Co. is reopening the old Livingston mine in the Bayhorse mining district of Lemhi County, 16 miles south of Clayton, Idaho, according to A. M. Lind, of Seattle. Harry C. Petrie, Seattle, is president of the company; C. A. Tout, Victor, Mont., vice-president; J. J. McGreedy, Seattle, secretary-treasurer, and Henry Lears, general manager. The Livingston mine is credited with shipping 180,000 tons of silver-lead ore before operations were suspended because of a fault which presumably cut off the ore. Leasers later encountered the ore underneath the fault and had produced about 1,000 tons of ore up to the time the property was taken over by the present company. These latter shipments netted $32 per ton in silver, lead and zinc. The present company plans to continue sinking operations. The mine is equipped with a 200-ton mill, aerial tramway, and substantial mine buildings.

★ The old Hercules mine is to be reopened and further prospected, according to reports. The Hercules orebody was wide and rich for several hundred feet in length but was cut off by a cross fault, beyond which it has never been located. It is understood the property will be diamond drilled to locate the downward extension of the known ore zone, which had largely been replaced by iron pyrites in the lower levels.

★ Golconda Mining Co. has signed an agreement with the Square Deal Mining Co. which provides for the extension of exploratory work easterly into Square Deal ground from Golconda's No. 10 mine level.

★ The Mineral Mountain property is being developed by crosscutting from the 2,300 level in the old Polaris shaft. This property will also be crosscut from the 3,000 level in the Silver Summit shaft.

★ Albert M. Nash, manager of the Hope Silver-Lead Mining Co. at Clarksfork, reports that the company's new shaft operation has encountered its objective, the Pearl Fault structure, on the 700 level and a satisfactory test run of ore has been made in a newly completed milling plant. Development work is now progressing in a drift along the vein structure to reach a point where U. S. Bureau of Mines diamond drills have indicated large orebodies.

★ Metropolitan Mining Co. reports receipt of $7,315.52 as its share of the production from the Yankee Girl vein for the month of May. The property is operated by the Sunshine Mining Co. Metropolitan owns a 16% interest in the ore production. The ore mined in May totaled 860 tons, and milled out at 62.71 oz. of silver per ton.

★ Lookout Mining Co. has started to drive a 300-ft. crosscut tunnel from its No. 3 tunnel level to connect with the shaft of the Sunset Minerals Co., which has taken a contract to drive a crosscut into Lookout Mountain ground from the 1,000 level. The Lookout Mountain Co. has recently acquired the Lynch group of claims, giving it extensive mineral holdings in the Pine Creek area.

★ The Golconda Mining Co. has signed an agreement with the Square Deal Mining Co. which provides for the prospective development of Square Deal ground by driving a crosscut tunnel from the No. 10 level in the Golconda mine, according to A. H. Featherstone, president of Golconda. Both properties are in the north side mineral belt between Wallace and Mullan.

★ Charles A. R. Lambly, superintendent of the Pend Oreille Mines & Metals Co., submitted testimony before an Army engineer's hearing on the proposed dam construction on the Pend Oreille River showing that the Metaline mining district contains three distinct mineral-bearing geologic structures: the Josephine horizon, which has produced 3,500,000 tons of lead-zinc ores, and will eventually produce an estimated 200,000,000 tons;

the Yellowhead horizon which has not been so well explored, but holds a proven deposit of 200,000 tons of commercial lead-zinc ore; and the Reeves horizon which may have a potential output of 200,000,000 tons. At least 10 known orebodies have been developed in this formation, and a 1,000-ton milling plant is now under construction.

ALASKA

Consolidated Mining to investigate lead-zinc property — U. S. Smelting expects good season

★ Consolidated Mining & Smelting Co. of Canada, at Trail, B. C., is reported ready to start an investigation of a large lead-zinc property in McKinley Park, according to Mrs. Lois McGarvey of the Fairbanks Mining Exchange. Negotiations were begun some years ago but were dropped because of the war.

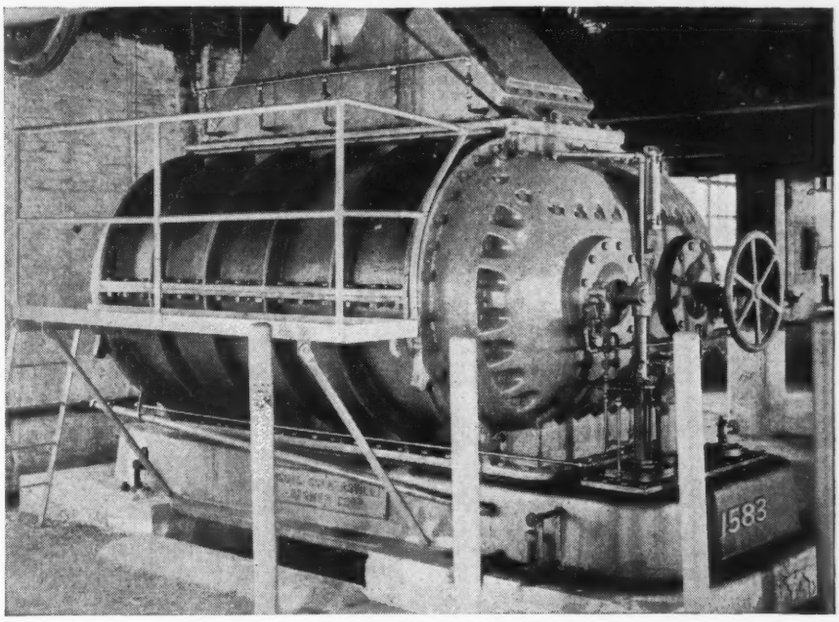
★ Art Glover, assayer for the Territorial Department of Mines, reported closing the Department of Mines office at Nome, because of the small amount of mining activity in that area this season.

★ Mike Erceg, drill contractor of Fairbanks, says high costs of labor and materials are the cause of slow revival of mining in Alaska but L. A. Dahners, assayer for the Territorial Department of Mines, at Anchorage, reports a number of World War II veterans among this season's prospectors in that area.

★ Alaska Juneau Gold Mining Co. reelected the same directors at its annual meeting, and appointed the same officers, according to C. N. Norris, president. The company's operations are still inactive because of high costs of production.

★ Mining activities in the Ketchikan area are of a wide variety. Inar Erickson is installing machinery at the Mahoney zinc mine, at George Inlet. Aluminum Company of America is continuing work at the limestone property at Edna Bay. Gold operations will be continued at Lucky Nell, on Twelve Mile Arm, and at Santiago-Alaska Mines' property at Dolomi. Copper mining will continue at Rush and Brown mines, and copper and paladium at the Salt Chuck mine, on Kasaan Bay. Permanente Metals Co. of California, is working the limestone property at View Cove, and limestone is being shipped from the quarry on Dow Island.

★ D. D. Stewart, Territorial Commissioner of Mines, after returning to Juneau from an extensive inspection trip in the Territory, reported that better labor conditions are responsible for increased interest and the expansion of mining operations during the 1947 mining season.



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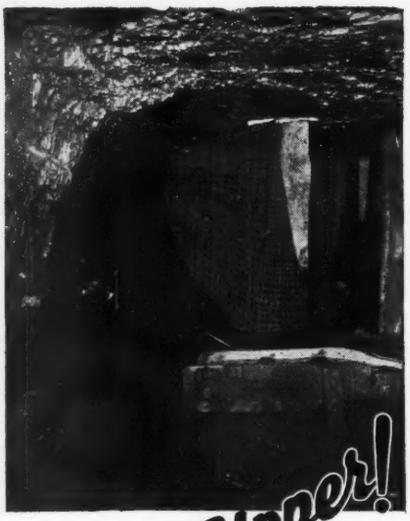

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Alaska (*Continued*)

★ Dan Creek mine, in the Kennecott area, closed since 1941, will begin operations this summer, according to Jack O'Neill. A new dam and pipeline will be installed.

☆ Considerable activity out from Fairbanks is due to the good supply of water. Wrede Brothers have taken pans with from $3 to $5 from a location on Deadwood, where they will operate later in the season. Mastodon Mining Co.'s property, also on Deadwood, is in charge of Sig Moe. Harold Christensen is supervising a crew of 14 men on Harrison Creek, at the Berry dredge. Roy Hamilton and Associates are working on Harrison Creek. Tom Saterlee will operate on Faith Creek, and Wilbur Jewel will be on Gold Dust.

★ Roy B. Earling, vice-president of U. S. Smelting, Refining & Mining Co., reports that a good season is expected even with the labor shortage. Operations at Cripple Creek, near Fairbanks, started in June with a Monighan dragline. The dredges at Ester, Pedro, and Cratanika were operating, and if enough men are available, it is hoped that the thawing plant at Little Eldorado and the stripping plant at Dome may be utilized.

★ A development program is being undertaken at the Webfoot property in the Willow Creek district by the Webfoot Mining and Milling Co., Seattle, Wash. James M. McDonald, mining engineer, is president of the company and in charge of operations. Edward N. Brooks and Charles S. Anderson are officers and directors. Engineering and geological investigations during 1946 indicate a promising gold-quartz vein.

CANADA

Steep Rock to increase production —Parity of gold price and high labor costs cut mine profits

★ The combined value of Canada's exports of iron, nonferrous minerals, and nonmetallic minerals and their products in April amounted to $44,422,000, down $220,000 from April, 1946, while imports of the same materials and their products were valued at $104,336,000 in March compared with $59,434,000 in March, 1946. Canada's foreign trade in April resulted in an unfavorable balance of $32,000,000. Imports from the United States have increased steadily since July, 1946, when the Canadian dollar was raised to parity with the U. S. dollar.

The May index of industrial activity prepared by the Canadian Bank of Commerce showed iron and steel trades at 126 (down from 133 in May, 1946); nonferrous metal products at 143 (135 in May, 1946); and nonmetallic mineral products registered 99 compared with 101 in May of last year (1937 = 100). The cost of living in Canada advanced from 120.8 in April, 1946, to 130.6 in April, 1947.

☆ The loss of $3.50 per ounce suffered a year ago by Canadian gold producers, when the gold price was reduced to parity with the United States, was further aggravated in December by wage increases in the mining industry. A minor concession made by Finance Minister Abbott through tax adjustments and depletion allowance has failed to offset the serious decline in profits. It has been reported that one-third of the 35 producing gold mines in Ontario are either breaking even or losing money. In a typical case where annual gold recovery amounts to $3,500,000 it is shown that a tax allowance of $50,000 has been granted as compared with losses amounting to $600,000.

★ Boards of conciliation met on July 7 to consider several disputes at gold mines in the Porcupine camp. Hearings are also being continued by boards at Kirkland Lake to consider union demands for the check-off of union dues and pay increases of 6¢ an hour. No recent settlements have been reported.

★ The Quebec North Shore and Labrador Railway is to be completed in 1949, according to an unofficial announcement. This will provide a 350-mile outlet from the major iron-ore deposits from Knob Lake to Seven Islands, on the Gulf of St. Lawrence, where it is proposed to build ore-loading docks. Diamond drilling and underground exploration in 1947-1948 are expected to increase the volume of indicated iron ore to about 300,000,000 tons.

★ Canada has been allocated 300 tons of tin for the second half of 1947 by the combined Tin Committee, out of the total of 11,331 long tons under interim allocations to the United States and 21 other nations. It was announced that greater supplies are expected to become available about August 20, when further allocations will be made.

QUEBEC

Consolidated Central Cadillac Gold Mines started production in June, as reported by T. Koulomzine, consulting engineer. The mill rate is to be increased to 400 tons a day. Underground development since 1945 has resulted in blocking out an estimated 631,000 tons of ore averaging $10.54 (uncut) per ton in gold to a depth of 1,000 ft. The ore occurs in two separate structures: (1) a series of flat-lying quartz-tourmaline veins located between the Cadillac break and iron formation to the north; and (2) vertical sulphide structures in the iron formation.

★ Bachelor Lake, the scene last year of a promising discovery by O'Brien Gold Mines, is now reported to be a center for extensive staking and pros-

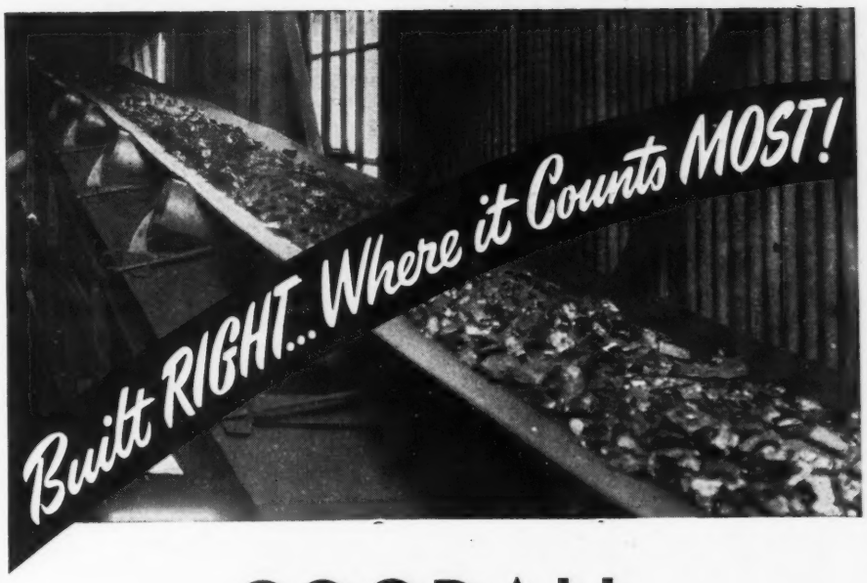
pecting activity over a district about 30 miles in length. The area includes Unknown Lake, north of Waswanipi, and Lake Opawica and the Opawica River. In addition to surface work and diamond drilling on the O'Brien showing, prospecting crews have been placed on ground held by Dome, McIntyre, O'Leary Malartic, and Conwest. The discoveries have been reported in a band of Keewatin lavas similar to the formation at Chibougamau, about 100 miles to the east. A survey is to be made this summer by the Quebec Department of Mines for the purpose of building a road 25 miles to Bachelor Lake from the Lake Rose mine, where high-grade ore was produced before the war. There is a winter road to the Lake Rose mine from Senneterre and this year it is planned to gravel the first 37 miles for the purpose of servicing railroad construction northeast from Barraute.

★ Siscoe Gold Mines reports an operating profit of $105,060 for the first five months compared with $48,572 in the same period a year ago. Narrow, high-grade ore shoots in the Hope vein section east of the shaft have been an encouraging development this year and are expected to lead to further discoveries. The main ore zone hanging wall has also been found to be ore-bearing, as a result of drill exploration. The mill is being held at about 220 tons a day, with heads averaging $11.61 a ton in gold.

ONTARIO

★ Steep Rock Iron Mines had pre-production expenses to the end of 1946 amounting to $7,665,089. Write-off of 65¢ a ton was charged against the 830,409 tons produced last year, when gross receipts were $4,585,782 ($5.52 per ton, on which there was an operating profit of $1.39 per ton). Mining costs were $1.62 per ton. This year production is expected to be upwards of 1,500,000 tons, increasing to 3,000,000 within a year after production from the "A" orebody is secured. The vice president and general manager, M. S. Fotheringham, reports 72,481,678 tons of proven and probable ore in the "A" and "B" orebodies. Plans will soon be announced for providing the large capital needed for developing the "A" zone. Open-pit mining down to 600 ft. will develop an estimated 85,000,000 tons in both orebodies. Exploratory work has not yet been attempted on three other zones. Diamond drilling last winter on the "A" body indicated 53,000,000 tons to a depth of 575 ft. Cyrus S. Eaton is chairman of the board.

★ Madsen Red Lake Gold Mines proposes to deepen the shaft 650 ft. below the bottom 11th level at 1,950 ft., it was stated at the annual meeting by W. R. Askwith, managing director. Mill capacity will be increased from the present 400 tons a day to 800 at a cost estimated at $600,000. The ore grade reported for the first quarter this year was $8.13 a ton and reserves



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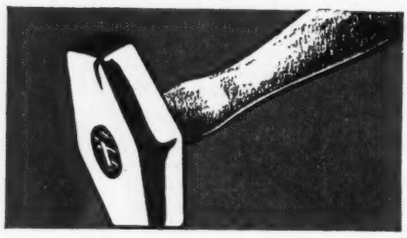

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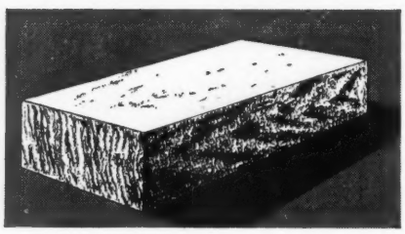

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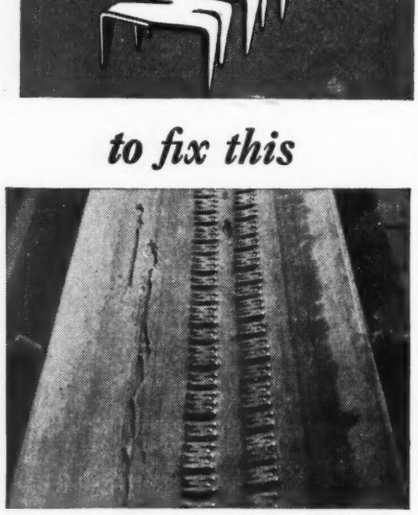

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Canada (*Continued*)

at the end of February amounted to 1,287,980 tons. In spite of the high labor turn-over, Madsen is one of the few Ontario gold producers now operating at capacity. E. G. Crayston is resident manager.

★ Campbell Red Lake Mines, which is 57% held by Dome Mines, reports that development work on all four of the levels has disclosed ore of good grade which locally shows concentrations grading several ounces to the ton. The third level has supplied the highest values, with several areas represented by high assays for drill cores in sections not yet opened up. The four-compartment shaft down to 575 ft. is located at the west end of the best ore in the south zone, which continues farther west another 200 ft. and about 1,000 ft. to the east. While drifting has been confined to the andesite, the diorite located farther to the south was shown by drill holes also to be ore bearing. H. C. Young is mine manager.

★ Renabie Mines, 225 miles west of Sudbury, started production in June as Ontario's first new postwar gold producer. The initial mill rate of 300 tons daily can be doubled by installing an agitator and a second set of flotation cells. Ore reserves in four orebodies are estimated at 314,722 tons averaging $10 a ton. The No. 2 shaft, to a depth of 425 ft., gives access to three levels. From the original discovery in 1939 to the end of April, 1947, expenditures amounted to $932,224 and additional funds have since been used. Macassa Mines holds 76.5% interest. R. A. Bryce is president and M. H. Froberg is consulting geologist. The three-compartment No. 1 shaft was completed in 1942 to a depth of 281 ft. and development was done in five orebodies on the 125 and 250-ft. levels. The mine was closed down during the war and reopened in April, 1946.

★ Donald F. Hurd, president of Osulake Mines, reports that on July 1 shaft sinking had reached a depth of 150 ft. A program of horizontal diamond drilling is now in progress while sinking is being continued to a depth of 480 ft. Three levels are to be developed to open the orebody indicated at 240,750 tons by the diamond-drill holes put down from surface. Two parallel ore zones show lengths of 450 and 650 ft. The mine is accessible over a 22-mile tractor road connecting with the railroad at a point about 25 miles west of Nakina. Working funds have been supplied by McWatters Gold Mines. Graham Bousquet Gold Mines, and Toronto brokers. George Dimitrieff is mine manager.

MANITOBA

★ International Nickel Company of Canada, Ltd., is conducting an airborne-magnetometer survey over large areas in the northern part of Manitoba including the Lynn Lake nickel-copper field. A long range Catalina amphibian capable of an average 400-mile daily survey, will be used. The plane has been engaged from Aero Service Corporation, Philadelphia, Pa.

★ In the annual report of Ogama-Rockland Gold Mines, Ltd., for the year ending Dec. 31, 1946, Gilbert Labine, president, stated that "it would appear that the mine should be able to produce a mill head of $15 per ton if and when it reaches the production stage." The following results of development work have been reported by the company, all values being over a four-foot width: 125-ft. level, 150 ft. of ore averaging 0.50 oz., and 25 ft. averaging 0.30 oz. of gold; 225-ft. level. 110 ft. averaging 0.28 oz., 40 ft. averaging 0.304 oz. and 225 ft., averaging 0.57 oz. of gold; 375-ft. level, 316 ft. averaging 0.31 oz., and 50 ft. averaging 0.50 oz. of gold. Gunnar Gold Mines, Ltd., has advanced $250,000 to complete shaft sinking to the 775-ft. horizon and continue development.

★ The report of Sherritt Gordon Mines, Ltd., for the first quarter of the year reveals that 141,101 tons of ore was milled from which was produced 5,463,466 lb. of copper, and 3,301 tons of zinc concentrate. Copper sales during the period exceeded production by 612,168 lb. An ample labor supply made a capacity operation possible. Profit for the mine operation, after provision for taxation but before write-offs, was $293,585. Some 2,000 tons of equipment and supplies were hauled from Sherridon over the winter road and 800 tons of ore from "A" orebody backhauled to Sherridon for tests in the pilot mill. Preparations are underway to conduct mapping and diamond drilling at Hughes Lake, which is considered to be one of the better gold prospects in the area. Work will also be resumed at Farley Lake, where six holes put down in 1946 yielded some encouragement.

★ San Antonio Gold Mines. Ltd., reports that sinking operations on the No. 4 winze started in May. Daily mill tonnage is now 440 tons. The company is also developing the Jeep Gold Mine, Ltd., nine miles northeast of the parent mine. The shaft collar has now been poured.

★ God's Lake Gold Mines Limited is conducting a complete geological survey of the Barrington Lake group of claims in the Granville Lake mining division. An eight-man party is under the direction of G. M. Brownell.

★ Noranda Mines, Ltd. have recently been granted a license to operate in Manitoba. The company is reported to have acquired several groups of claims in the Lynn Lake area. Citralam Malartic Mines, Ltd. is another newcomer to the Lynn Lake field, having acquired claims close to the Sherritt Gordon operation.

★ A freighting service utilizing as-

sault boats has been introduced to the Herb Lake district to service the operations of Howe Sound Exploration Co., Ltd., and Wekuska Consolidated, Ltd. Four-wheel drive trucks operate directly from the Hudson Bay Railway on the assault boats and thence to various mining properties.

BRITISH COLUMBIA

★ A move to secure modification of the British Columbia Hours of Work Act has been initiated by mining operators, exploration companies, diamond-drilling operators, and employees of all three, who have petitioned the Board of Industrial Relations to exempt exploratory work from the provisions of the Act.

★ The B. C. Federation of Labor has adopted a resolution submitted by the International Union of Mine, Mill and Smelter Workers urging removal of Federal regulations restricting the free sale of gold.

★ May production of Polaris-Taku Mining Co., Ltd., Atlin district, was 2,416 oz. gold. Increased production was made possible through the installation of a new Symons crusher. Heads have increased to 0.369 oz. per ton in May. Ore-reserve estimates have been reduced to 230,000 tons because of rising production costs, but the grade has been raised to 0.45 oz. gold per ton. All material grading 0.3 oz. or lower has been eliminated.

★ Shareholders of Premier Gold Mining Co., Ltd., endorsed a resolution to liquidate the company by a narrow margin on June 17. Of the 3,605,542 shares voted, 2,720,880 favored the proposal, and 884,662 opposed it. The motion required 75% of the votes cast for passage. R. F. Goodwin, president of the company and chief proponent of the proposal, said that Premier's capital was not sufficient to embark upon a systematic exploration policy in competition with other Canadian companies of much greater means. Almost all of Premier's participation, he said, has been secured without expense through the cooperation of American Smelting & Refining Co., in return for which the latter company had hoped to acquire some project too big for the former company to undertake. This failed to develop, and the president doubted if the smelting company would continue indefinitely to give Premier the benefit of their investigations. A. N. Wolverton, Vancouver stockbroker, and J. E. R. Wood led opposition to the proposal.

★ Exploratory diamond drilling, being conducted concurrently with the advancing of the long low-level tunnel of Morris Summit Gold Mines, Ltd., Portland Canal district, to reach two strong veins indicated by previous drilling, has intersected a 12-in. vein assaying 0.3 oz. gold per ton.

★ The No. 3 tunnel, being driven in the Big Star property of Spud Valley Gold Mines, Ltd., Zeballos district, has reached its objective zone at 650 ft.

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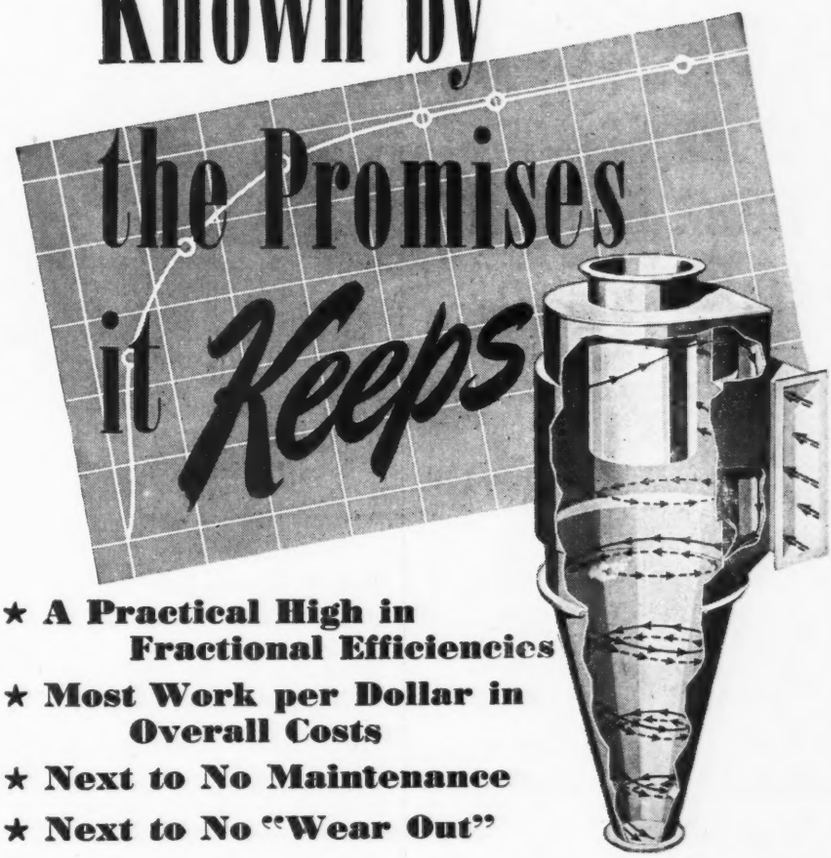

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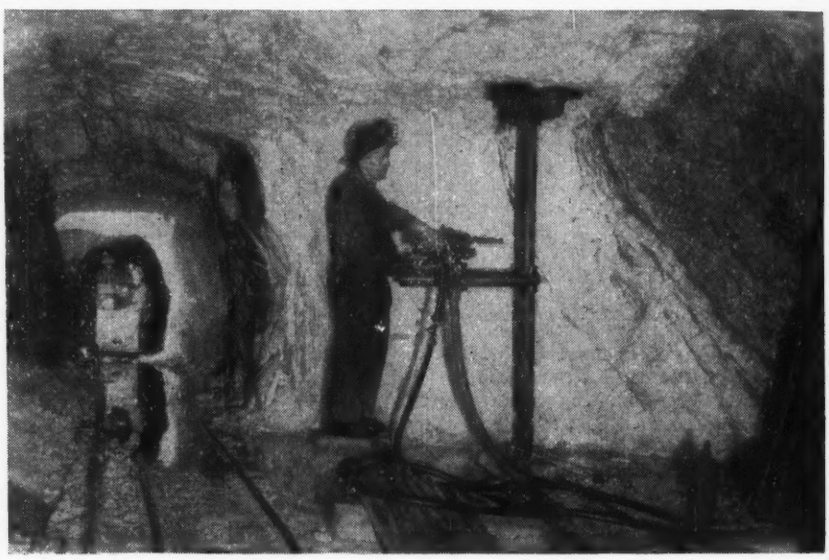

A FACE OF ORE on the 18th level of the Bralorne mine, gold producer situated in the Bridge River district of British Columbia.

Canada (*Continued*)

Dale L. Pitt, managing director, states face samples are of good milling grade and similar to ore previously mined on the No. 2 level, at an elevation 300 ft. higher. At 300 ft. the tunnel cut a vein, one foot wide and assaying three ounces gold per ton.

★ During the fiscal year ending March 31, 1947, Pioneer Gold Mines of B. C., Ltd., produced 6,729 oz. gold and 1,265 oz. silver, valued at $246,365, from 12,140 tons, averaging 0.57 oz. gold per ton from the Pioneer mine, Bridge River district. Ore reserves, as of March 31, were estimated at 149,961 tons averaging 0.464 oz. gold per ton, after deletion of all material grading less than 0.25 oz. per ton and without inclusion of any new ore from the '27' vein.

★ The 8-level crosscut of B.R.X. (1935) Consolidated Mines, Ltd. in the upper Bridge Valley has cut the California vein 70 ft. from the shaft station. Drifting, now in progress, is expected to reach the section in which diamond-drill cores indicated the presence of a commercial orebody within 200 ft.

★ Pacific Eastern Mines, Ltd. reports the coalescence of two small stringers in the P. E. mine, Bridge River district, into a 2-ft. vein averaging $17 per ton.

★ The Granby Consolidated Mining, Smelting and Power Co., Ltd., is currently treating 4,800 tons of ore daily at the Allenby concentrator. The favorable price for copper has permitted the mining of more than 60% of all mill-feed during recent months at the Copper Mountain mine from sections not included in the ore reserves, which as of Dec. 31, 1946, were estimated at 9,982,000 tons grading between 1.2 and 1.3% copper. The grade of ore treated during the past month is 0.72% **Cu.**

The Granby company recently shipped three cars of lead-zinc ores from its Hewett-Galena Farm property in the Slocan district, where

twelve men are employed on development work under the direction of Earl Snyder in stoping and raising above the 10-level.

★ The mill of Kelowna Exploration Co., Ltd., is currently treating 275 tons of ore daily from the Nickel Plate mine, Hedley, B. C. To maintain this rate, 360 tons of ore are mined daily on the 44-hr. weekly basis. A new ball mill, three thickeners, three agitators, a 12x14-ft. filter, and two 66-in. flotation cells have been installed to increase mill capacity by 100 tons. This increase in capacity will be in effect by Nov. 1.

★ During the fiscal year ended Dec. 31, 1946, Hedley Mascot Gold Mines, Ltd., produced 9,206 oz. gold, valued at $328,110 from 32,448 tons of ore averaging 0.311 oz. gold per ton. Ore reserves were estimated at the year-end as being sufficient for 1½ years' operation at the present rate and grade (0.4 oz.) of mill-heads. The mill is currently treating 175 tons daily of which 75 tons, grading 0.75 oz. gold per ton, originates from the Good Hope group, for which the company has advanced the full purchase price of $100,000. A new company to be known as Good Hope Mines, Ltd. has been incorporated to acquire title to the Good Hope, Nighthawk, and Horsefly groups, all recently purchased by Mascot.

★ Valley Mining Co., Canadian subsidiary of New Jersey Zinc Co., has taken an option on 48 claims adjoining the holdings of Rossland Mines, Ltd., in the south belt of Rossland camp. Dr. H. C. Gunning, consulting geologist, states the claims are on the general regional strike and are thought to cover the top of a body of monzanite, one of the favorable rocks of the district. The company has also secured an option on the Truman group of lead-zinc claims, situated between the Emerald and Reeves-MacDonald mines in the Nelson mining division. An extensive diamond-drilling program is planned under the direction of Dr. E. P. Kaiser, geologist, and the immediate supervision of Ralph MacDonald, mining engineer.

★ Western Exploration Co., Ltd., resumed milling May 20 and in the balance of the month treated 966 tons of ore. Shipments included 83 tons of lead concentrate assaying 71.0% lead and 159.6 oz. silver per ton and 210 tons of zinc concentrate assaying 59.6% zinc and 14.8 oz. silver per ton. Operating profit was estimated at $17,000. The company owns the Standard, Mammoth, and Enterprise mines in the Slocan district.

YUKON

★ Net profit of the Yukon Consolidated Gold Corporation, Ltd., during the fiscal year ending Dec. 31, 1946, was $69,699 after provision of $265,801 for depreciation (including amortization of ditches) but before amortization of mining claims. Dredges were

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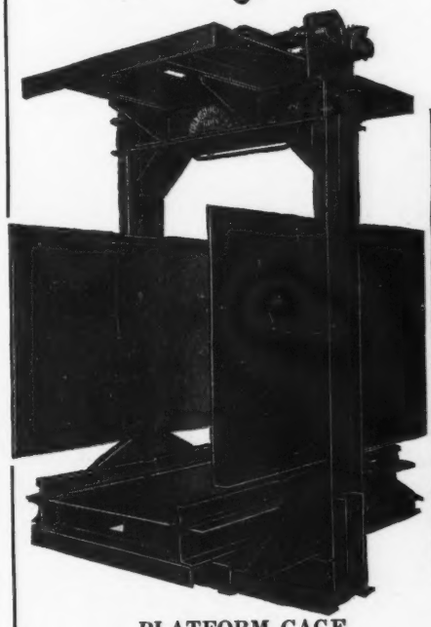
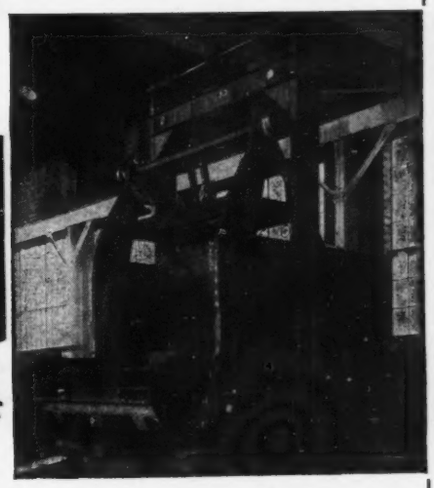


PLATFORM CAGE



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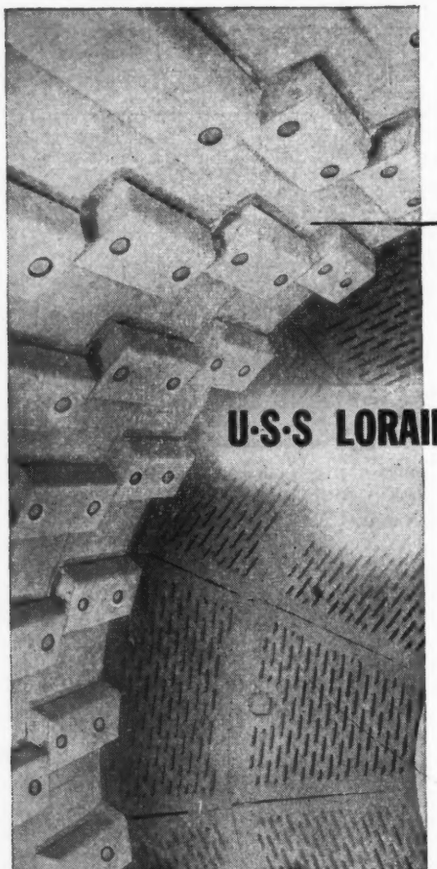

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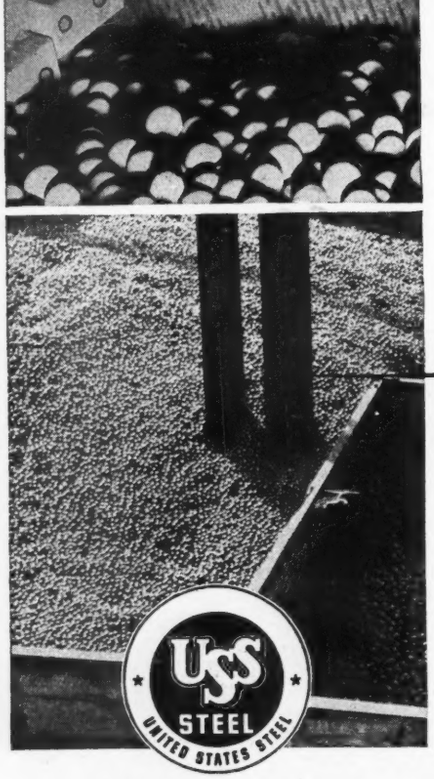

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UNITED STATES STEEL

Canada *(continued)*

operated on Klondike river and on Bonanza, Quartz, Middle Sulphur, Dominion, and Hunker creeks. Six stripping and thawing plants were also operated, the former at a cost of 9.56¢ per cu. yd. and the latter at 6.46¢ per cu. yd. G. Goldthorpe Hay, president, reported that present conditions are unfavorable for gold-mining companies because of the high cost of labor and materials, and because Canada has decreased the selling price of gold by $3.50.

★ Stan Peffer, an Arctic trader of Aklavik, reports that prospectors discovered high-grade gold deposits last fall, 175 miles north of Aklavik, near the mouth of the Firth River, and that this spring they chartered a plane to fly supplies into the area. Peffer believes they have the financial backing of some syndicate. The prospectors report the formation to be similar to that of the Yellowknife district.

★ Mike Cole has gone from Dawson to Hunker Creek with a "cat" to do placer mining with Tony Gergich. Other Dawson men in the same district are George Murdoch, Harry Allen, and George Sharples.

★ E. N. Patty reported in June that the new dredge at Henderson Creek, would be in operation about July 1. Another new dredge is on its way to Thistle Creek.

ARGENTINA

Gasoline price rise to aid hunt for more oil—ARMCO to direct iron and steel operation

★ Since June 16, the price of gasoline has been $0.33 per gallon, instead of the former price of $0.24 per gallon. The Government decree that set the new price said the increase was justified by the higher price of foreign oil and by higher costs of domestic production. The new price is expected to stimulate production and exploration. Argentine oil production reached a peak in 1943, when about 3,800,000 cubic meters was produced. The decline since has been due to worn equipment and shortage of supplies. YPF, the Government organization, controls about 70% of Argentine oil production.

★ The Senate has sanctioned the Siderurgical Plan, with modifications introduced by the Chamber of Deputies, which chiefly provide that private investment in the Sociedad Mixta Siderurgica Argentina may be no greater than 49%. The Plan includes erection of blast furnaces and steel plant of 1,000 tons daily capacity in San Nicolas on the Parana River. The plant will use imported ores and fuels. The technical direction of the enterprise

will be entrusted to ARMCO, S. A., which is connected with the American firm of the same name.

★ Extensive borax deposits are known in the province of Salta. Of 138 properties, 108 belong to the Cuevitas Trading Co., which has done nothing in many years to develop these mines. Dr. Cornejo Linares, governor of the province, declared recently in a message to the legislature that the attitude of this company was very inconvenient to the interest of the State, and he suggested remedial action of some kind.

★ The School of Engineering of the University of Cuyo has been elevated to the rank of Faculty of Engineering. This school is the only one in Argentina where mining engineering is taught. New curricula have been added to the course this year, and the government of the province of San Juan is cooperating with the university to improve laboratory facilities.

CHILE

Copper company officials visit Chile — Paipote smelter to be built by Allis-Chalmers

★ Cia. Minera Aysen, a lead-zinc property near Lago Buenos Aires, has received a loan of 12,000,000 pesos from the Mining Bank to build a 50-ton mill. The size of the loan, large for a 50-ton plant. is made necessary by the remote location of the plant. Concentrates of the mill will have to be shipped out through Argentina, because there are no roads connecting the mine with Chilean ports.

★ Cia. Minera Disputada, last of the medium-sized copper mines to resume operations, is milling 2.8% copper ore at 80% of capacity, about 400 tons per day. A shipment of 800 tons of concentrate recently went to the American Metal Co. at Carteret, N. J.

★ James R. Hobbins, Clyde E. Weed, William H. Hoover, Thomas E. Tatum, Thomas Campbell, and John D. Cotter, all of Anaconda Copper Co., arrived in Santiago recently for conferences with Chilean Government officials. E. T. Stannard, president of Kennecott Copper Co., has been in Santiago for the same purpose. It is believed the purpose of these visits was to discuss means of improving labor relations at the companies' properties, and matters affecting taxation and distribution of the copper companies' output. It is significant that editorials have appeared repeatedly of late in Santiago newspapers calling for creation by law of a Copper Sales Corporation, similar to the Nitrate Sales Corporation. This would give the Chilean Government a voice in planning production rates and sales quotas at the copper mines.

★ The dispute at Braden over the

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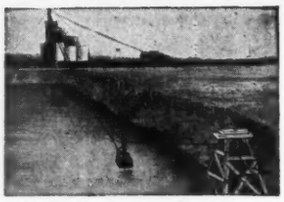

Sauerman Slackline Cableway at work in deep gravel pit.

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Chile *(Continued)*

percentage of profits to be given the workers has been settled by the union's acceptance of the company's offer of 2,500,000 pesos (about $81,000). Under Chilean law, a company that is unionized and makes a profit must each year pay its employees 10% of its profits or 6% of the total payroll. The union at Braden wanted the 6% of wages; the company offered the 10% of profits.

★ Caja de Credito Minero announced recently a two-year plan to help the small metal mines of the country. The plan means spending $7,700,000, distributed as follows: Paipote smelter, $4,100,000; subsidiary mines, $1,300,000; for mines outside the smelter's radius, $1,000,000; for coal mines, $1,000,000; to develop production of metallic salts, $320,000. The money will come from the funds the Caja receives from copper produced in Chile and from the special tax on copper.

★ Sr. Gonzalez Videla, president of Chile. Sr. Luis Bossay, minister of economy. Sr. Videla Lira, president of the Mining Society; and many other officials of Government and industry were present recently at the laying of the cornerstone of the new Paipote copper smelter at Copiapo. It was announced a few days later that the Caja de Credito Minero and Allis-Chalmers Mfg. Co. had agreed upon a price for the smelter's equipment. The company will supply machinery, structural steel, magnesite and silica brick. The price is $2,268,000, f.a.s., New York. This is the largest order ever placed by a Chilean organization for mining equipment with a single American firm. The occasion was celebrated with a luncheon at the Carrera Hotel with Messrs. Wisness and Diaz, of Allis-Chalmers, as hosts.

PHILIPPINES

Chrome and manganese demand still good—Big Wedge gets only $39 for gold on London market

★ Production of the Big Wedge mine in Baguio for June was $148,500 from 7143 tons milled, averaging $20.75 per ton. Output during the first half of the month was off, due probably to dilution from top slicing. In the second half, grade of ore picked up to an average of $27.25 per ton. The Atok company, which operates the mine on a profit sharing agreement, sold the bullion in London and realized between $38 and $39 per ounce on the free gold market.

★ It is reported that Mindanao Mother Lode will begin operation of its new mill in August, on ore from the upper levels of the Tabon-Tabon vein and the No. 50 vein, both of which are above the flooded portion of the mine. In the meantime pumping equipment

is scheduled to arrive early in July, and as rapidly as the lower levels are unwatered, they will be rehabilitated. However, production from the 700 level is hardly likely before the end of the year.

★ Surigao Consolidated is milling low grade ore from the old open pit and is reported to be making a small profit. Work is going on in shaft repair and rehabilitating the lower workings, but heavy ground is impeding progress.

★ The Acoje chromite property was recently examined by a Government mining engineer to estimate ore reserves, preparatory to a Government loan to the company. While no development or production is going on at present, a crew is maintained on road repair from the mine to the shipping pier.

★ The first shipment of chromite from Mindanao was made last month by the Luzon Stevedoring Co. which shipped over 4,500 tons from the Opol property at Cagayan. Sam Leitman, well known before the war in chromite and manganese mining, is in charge of the work. The same operators are developing the old manganese mine at Anda, on the island of Bohol.

★ A new manganese property, known as the Bay-Bay, located on the island of Leyte, is doing well. According to the company's engineer, there is a large deposit of residual ore that is easily concentrated by washing to make a 51% manganese product. The concentrates have been contracted for sale, and several years supply of ore is reported in sight.

★ At Busuana, William DeCarbonel is operating the old Japanese manganese mine for Luzon Stevedoring Co. Additional mines are being opened up.

★ The Antipolo mine about 75 km. from Manila, which made a highly encouraging production record in 1941, has recently been acquired by Soriano interests. A 75-ton mill had just been completed before outbreak of the war. The grade of the ore in the winze below the 300 level was definitely high grade and of good width.

RUSSIA

Rotaries now replace churn drills —Molybdenum output is up— Tungsten mining increased

★ Rotary drills have been substitutes for churn drills in blast hole work in the open pits of the Bogoslav coal mine. Holes are vertical, 6 in. in diameter. The rotaries were used at first only in coal, but they have been found suitable for drilling in gangue as well. The rotary drills use fishtail bits reinforced by the Russian alloy, pobedit, which is also used in making detachable rock drill bits. About 1¼ hours are required to drill an 80-ft.

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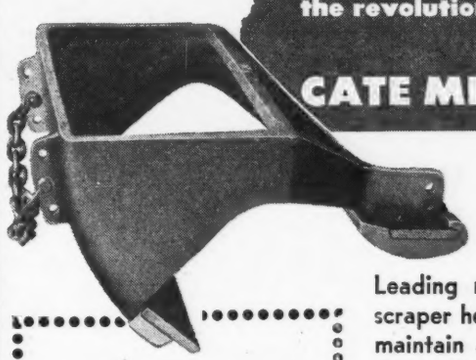

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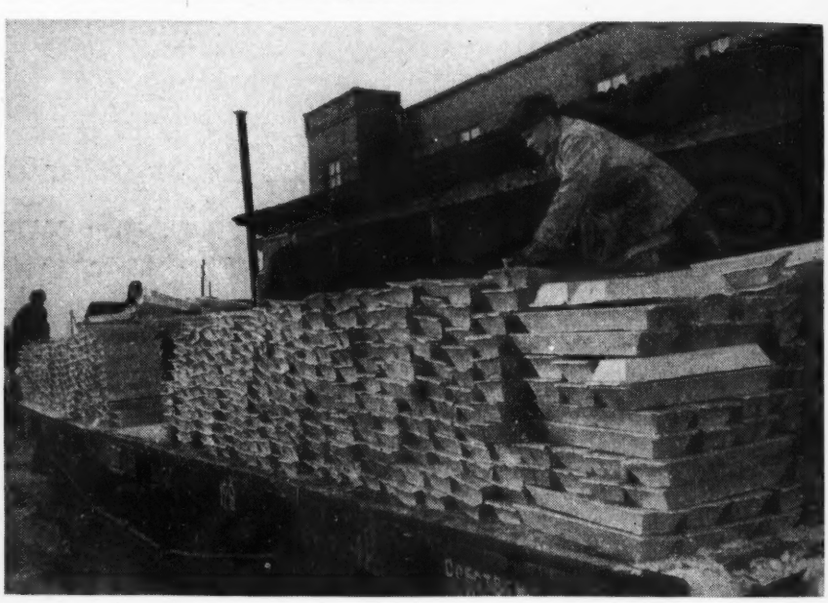
WORKERS COMING OFF SHIFT at the Tyrny-Auz tungsten and molybdenum operations in the Caucasian Mountains. U. S. S. R. Sovfoto.



RUSSIAN WORKERS loading aluminum at Siberia's first aluminum plant near Stalinsk, in the Kemerovo region. U. S. S. R. Sovfoto.

Russia *(Continued)*

hole in the coal. In gangue the rotary drills from 15 to 21 holes, 20 ft. deep, in one 8-hour shift, which is about 7 times as much work as was obtained from the churn drills. Each rotary bit can drill about 1,600 ft. in gangue before it wears out. Wear is negligible in drilling coal. One drawback to the use of rotaries is that they can not be used in boulders or in solid rock. Attempts to use them thus have failed.

★ Growth of the Soviet molybdenum industry is reported to be phenomenal. No figures are available, but it is known that output of the metal has more than quadrupled between 1940 and 1945, and present plans call for doubling the 1945 output by 1950. This increase has, and will, come from intensive development of the large molybdenum deposits discovered shortly before the war in the desert east of Kounrad, near Lake Balkash. Two new flotation mills are now recovering molybdenum concentrate from ore from these deposits. The second largest molybdenum center is the Tyrny-Auz tungsten-molybdenum combine in the North Caucasus. Both mine and mill of this operation were blown up by the Germans, but they have been rebuilt and the aim is quadrupled output by 1950. Molybdenum has been discovered, and development is under way, in at least five other locations in the USSR.

★ The Soviet tungsten mining industry, which more than doubled its output during the war, is undergoing a still more rapid expansion at present, and by 1950 it is expected to be producing at a rate of 4½ times that of 1940. No tonnage figures are available. Before the war, tungsten was mined in Transbaikalia, South Urals, Altai, the Far East, and the North

Caucasus, but during and after the war, large tungsten deposits were discovered and are being exploited in Central Asia, particularly in Samarkand.

AUSTRALIA

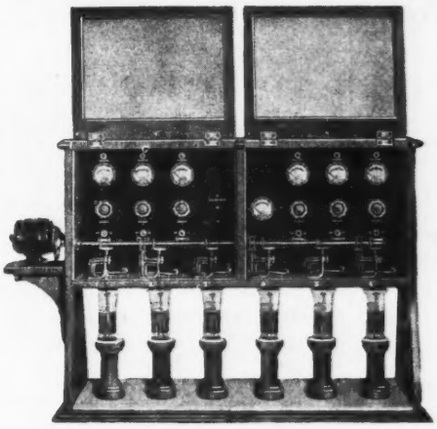
Lake View & Star are returning to normal—Big Bell to extend its interests—Lake George reports

WESTERN AUSTRALIA

★ Lake View and Star Ltd., at Kalgoorlie, the largest gold mine in Australia, is gradually getting back to normal production, although labor is not returning at the expected rate, and supplies are still difficult to obtain. Of considerable interest is the discovery of new orebodies in the northeastern part of the leases. Crosscutting from the main lode has disclosed important occurrences at the 300 ft. and 500 ft. levels. Total ore reserves are estimated at 3,949,000 tons, assaying 4.93 dwt. per ton, of which positive ore amounts to 2,884,000 tons; probable ore, 316,000 tons and broken ore 748,600 tons. Ore milled in the year totalled 383,081 tons with a head value of 5.1 dwt. per ton. Recovery was 90.66%.

★ Big Bell Gold Mines Ltd. is now in active production after closure during the war. It is the largest low grade gold mine in Australia, and the normal pre-war rate of production was about 45,000 tons of ore per month, assaying about 2.8 dwt. gold per ton. Since operations began in 1937, more than £A2,000,000 worth of gold has been produced. Output for February, 1947 was 4,221 fine oz. and for March, 4,851 fine oz. The company is about to extend its interests into other districts. A working option for 12 months has been taken over the southern part of the long main line of lode at Meekatharra, including the three largest productive leases on the field, the total area being 900 acres. The northern portion of the area contains the deeper worked mines in which the ore shoots were long and wide, and were followed by previous operating companies to a depth of 1,465 ft., the width reaching 50 ft. At the southern end, the workings do not exceed 200 ft. in depth and the shoots worked have been small, but high grade. The orebodies are intimately associated with porphyry dykes. The company's exploratory work will include a preliminary geological survey followed by diamond drilling. It is also planned to erect a special pilot plant for bulk testing, a practice which was followed in the initial testing of the Big Bell orebody.

★ The Western Australian government intends to encourage the State to win as much gold as possible, and



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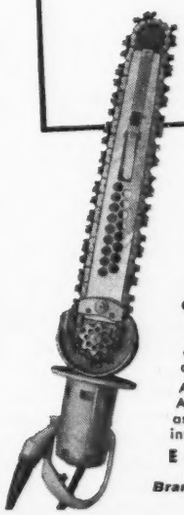

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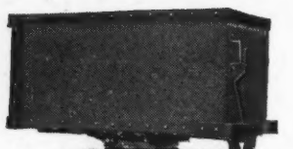

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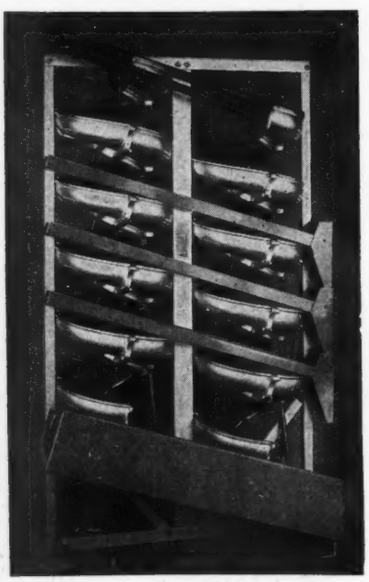

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Australia (*Continued*)

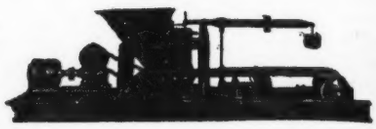
to this end every effort will be made to increase the population of the goldfields. There is strong desire on the part of individuals and the operating companies to increase production by expansion in existing mines and by the discovery of new lodes, or the reopening of those idle mines to which conditions will permit some measure of success. To the small operator assistance is being given by the services of State batteries for treatment of gold ores, by the carrying out of drilling and by the hire of hoisting and air compressing plant. Both large and small operators will be assisted by geological and geophysical surveys and it is proposed to reduce the charges for water supplied to the southern goldfields. Efforts will also be made to provide water supplies in localities in which conditions for adequate water conservation are difficult. Granting of large reservations to strong companies will probably be continued in localities where it is evident that proper prospecting can be carried out only by the use of adequate capital, and that conditions are unsatisfactory for operations by prospectors and small operators. Care will be exercised to ensure that such large areas are actively explored during the period of the lease.

★ Wiluna Gold Mines Ltd. is about to commence work on the development of the Mount Charlotte group of mines at Kalgoorlie, which is held under option. This group, in which more than 1,000,000 tons of ore is indicated to moderate depth by diamond drilling may, it is hoped, prove to be of sufficient size and value to employ successfully both the capital and plant of Wiluna Gold Mines Ltd. which has now closed down the mine in the north of the State, which was worked at the rate of 50,000 tons of ore per month. The company's immediate plans involve the sinking of a new shaft to 1,000 ft., and 5,000 ft. of driving and crosscutting. The shaft is expected to have cross-sectional dimensions of 16x16 ft. and will be sunk 500 ft. in the first lift.

NEW SOUTH WALES

★ Development work at depth in the mine of North Broken Hill Ltd., Broken Hill, continues to disclose satisfactory results. At the 2,920 ft. level a crosscut has proved the lode to be 72 ft. wide, and the ore to be of high grade throughout the full width. Exploratory work is proceeding to ascertain the behavior of the lode channel beyond the De Bavay fault. A prospecting drive at the 2,600 ft. level has proved the fault to be of considerable width at that horizon; an extensive diamond drilling campaign is to be carried out from a base on the north side of the fault to explore for the position of the lode channel and the location of possible orebodies. The work will have an important bearing on the future of the north end of the line of lode. Output of North Broken Hill Ltd. is being increased gradually as miners become available; it is at present 28,500 tons of ore per period of four weeks, from which 5,300 tons of lead concentrate and 5,300 tons of zinc concentrate are recovered. Assay values of concentrates are:—Lead concentrate: 72% lead, 35.3 oz. silver, 4.7% zinc; zinc concentrate: 50.6% zinc, 1.5 oz. silver, 1.1% lead. Operations are limited by the industrial award to five days per week of 40 hours on surface and 35 hours for underground workers.

★ Life of Broken Hill South Ltd. will probably be extended. The southerly pitch of the orebodies has been steadily carrying them into the leases of Zinc Corporation Ltd. and shortening the available length in the South mine. Further, the large orebodies in the western bulges of the lode have been succeeded in depth by comparatively narrow lode which offered limited tonnage of ore and indicated the end of mining operations in about eight years. Intensive diamond drilling has always been a leading feature in the company's underground policy, and as a result of this work at depth a decision has been made to sink the main shaft a further 400 ft., from the 2,100 ft. level to 2,500 ft. It is stated that although developments cannot be regarded as of great magnitude, the sinking of the shaft is warranted for



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further exploration of the deep horizons. Ore reserves are estimated at 1,890,000 tons; the usual practice in estimation is to exclude all partially developed and indicated ore from the reserve figures.

★ Lake George Mines Ltd., which operates at Captain's Flat, in the southern part of the State, reported satisfactory results, particularly in the treatment plant, in the last financial year to June 30, 1946. The main shaft has reached a depth of 1,353 ft., its sinking being considerably delayed by shortage of labor, which has also retarded the general development program. Total progress in development and preparatory work was 11,084 ft., with, in addition, 4,401 ft. of diamond drilling. Three ore shoots are being worked; the Central shoot appears to be shortening, but the other shoots are evidently lengthening at the lowest level. Ore reserves were estimated at 1,382,753 tons and the average assay value was:—gold, 1.1 dwt.; silver, 1.44 oz.; lead, 7.24%; zinc, 12.35%; copper, 0.68%. These reserves are limited by the backwardness of development work at the 1,072 ft. level, due to shortage of skilled labor. The mill treated 135,244 tons of ore in 308 days, or at an average rate of 443 tons per day. Percentage recoveries were:—gold, 39.63%, silver, 73.81%, lead, 78.83%, zinc, 74.7%, copper, 58.7%. The ore is of unusual complexity, the mineral particles are in intimate association, and grain size is as fine as 17 microns. The work therefore, is considered very successful. Copper recoveries were increased 20% in the year by floating the copper ahead of the lead, using SO_2 to condition feed to the copper section.

TASMANIA

★ King Island Scheelite N. L., working by open cut, one of the world's largest tungsten deposits, proposes to increase milling capacity. Proved ore reserves are estimated at 1,763,692 tons and diamond drilling now in progress is expected to add considerably to this figure. In the past 48 weeks, ore treated totalled 127,415 tons from which was produced 581 tons of scheelite concentrate with an average value of 67.5% tungstic acid. Milling method is a combination of gravity and flotation concentration, and the new extensions to the milling plant will comprise additions to the flotation section.

AFRICA

New lead mine to use sink and float—Tax formulas given—Record set for drifting speed

★ Uruwira Minerals Ltd., which is developing the recently-discovered lead orebody near Mpanda in Tanganyika Territory, will use a Huntington-Heb-

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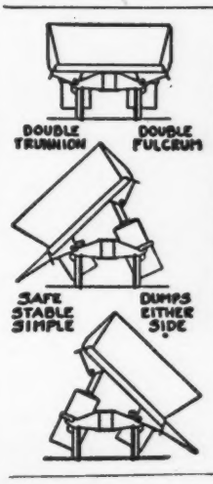

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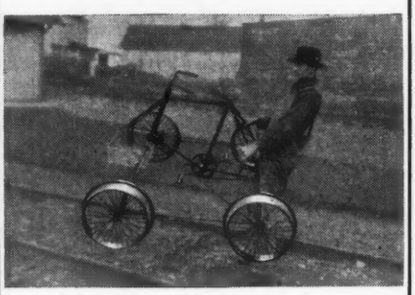

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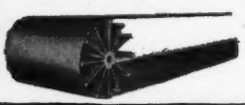

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Africa *(Continued)*

erlein sink and float process for pretreatment of its ore. The first equipment of this type to be set up at the property will be a small-scale unit that will act as part of the pilot plant to be operated there. Union Corporation has technical direction of this newest of the world's lead mines.

★ Leases have been granted to four more gold mining companies in the Orange Free State. Two of these went to Free State Development and Investment Corporation; Western Holdings got a second lease; Blinkpoort's lease was the fourth. Eight such leases have now been granted. The slice of the earnings of these companies that goes to the Government has already been calculated for each mine. Different formulas have been set up for the various mines, and the Government's portion will be as given in the accompanying table. Note the very large portion set aside for the Government from the earnings of Western Holding's No. 2 and the Blinkpoort leases. It was on the boundary between these two leases that the famous and fabulous Geduld No. 1 borehole was drilled.

★ Blyvooruitzicht Gold Mining Co., Ltd., has intersected the Carbon Leader in its borehole No. 1 at 8,983 ft. and a further reef band at 8,986 ft. The total value of the whole mineralized zone of Carbon Leader in this intersection is 5.7 dwt. over a channel width of 38.5 in.

★ Increased working costs and depleted reserves have made it necessary to plan to stop operations at van Ryn Gold Mines Estates Ltd. The shutdown was to begin on July 1, 1947, although some work would be done for a few weeks thereafter. Since 1894, van Ryn has milled 23,060,607 tons of ore for a revenue of 25,592,337. Dividends totalled 4,107,000. The company was employing 370 Europeans and 3,161 natives.

★ A new mechanical air-driven loader enabled Grootvlei Gold Mining Co. to develop 804 ft. in 26 days recently. This shatters the old Rand record of 615 ft. in the same period.

★ South African finance minister Hofmeyr said recently in a speech in Odendaalsrust, Orange Free State, that he considered a rise in the price of gold as extremely unlikely. He made the reference in connection with the comment that the development of the Free State gold field would go on even if there were no rise in the price of gold.

Percentage of Profits Payable to Government from Earnings of New Orange Free State Companies

Profit as Percent of Recovery	St. Helena	Welkom No. 1 Freddies (2)	Welkom No. 2 & 3	Western Holdings No. 2 & Blinkpoort
6	5	0	0	0
10	5	6	5	12
15	5	9	7.5	18
20	5.5	10.5	8.75	21
30	7.4	12	10	24
40	8.25	12.75	10.625	25.5
50	8.8	13.2	11	26.4
60	9.17	13.5	11.25	27

Plans Drawn for El Paso Mining Convention

E. McL. Tittman, general manager of the El Paso smelting works of American Smelting & Refining Co., has been appointed chairman of the El Paso Mining Committee which will sponsor the 1947 International Mining Days celebration and make arrangements for the American Mining Congress, Western Division, convention which opens Oct. 27 and continues through Oct. 29. Technical mining sessions will be held in the auditorium of the Scottish Rite Temple and entertainment program at Hotel Cortez.